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URBAN FOREST MANAGEMENT / MASTER PLAN



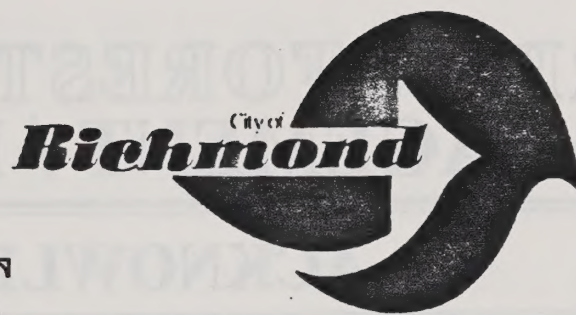
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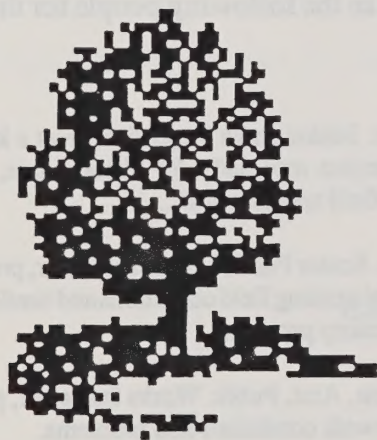
PREPARED FOR:

CITY OF RICHMOND, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
OPERATIONS AND MAINTENANCE
PARKS & LANDSCAPING DIVISION

VOLUME 1 OF 3
FINAL REPORT
October 1989



URBAN FOREST MANAGEMENT / MASTER PLAN



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Mayor

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City Manager

FINAL REPORT
October 1989

Lawrence H. Loder
Public Works Director

URBAN FOREST MANAGEMENT / MASTER PLAN

ACKNOWLEDGEMENTS

We would like to extend our thanks to the City Council, city staff and the many citizens who participated in this project and who will undoubtedly continue to support the greening of Richmond as the Urban Forest Management Program is implemented. We would also like to thank and recognize the following people for their special contribution to this project:

Peter C. Ingram, Public Works Superintendent for Parks and Landscaping and acting Deputy Director of Public Works, was responsible for the original project concept, authored the request for proposals, chaired the consultant selection committee and served as the city's project manager/contract administrator. He provided overall direction and facilitated staff, council and citizen input throughout the project.

Kirt Hunter, Assistant City Engineer, provided valuable technical review and philosophical support to the project.

Mark Hamilton, Management Information Systems Coordinator, provided essential technical and licensing guidance on the urban forest management computer software system created for the city as part of this project.

Ted Knowlton, Public Works Superintendent for Streets and Sewers, served on the consultant selection committee and provided continuous input throughout the project.

Dwight Pilz, Public Works Senior Engineer, served on the consultant selection committee.

Charles Carter, Assistant Planner, served on the consultant selection committee.

Fred Gaul, Recreation and Parks Commissioner, served on the consultant selection committee.

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Herman Phillips, Senior parks Supervisor, was a key resource throughout the project especially for historic data, geographic information, and field coordination.

Mitch Anderson, Senior Public Works Inspector, provided first-hand knowledge of existing field conditions and needs in the early stages of the inventory process.

William Robinson, Asst. Public Works Inspector, provided information on sidewalk conditions and problems.

CONSULTANT TEAM:

Thomas J. Pehrson, Urban Forestry Consultant, Orinda, California, was the prime consulting contractor for the project.

Barrie D. Coate, Horticulturist

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Franklin Miller, Environmental Technician

Eric Wingfield, Environmental Technician

Larry Faulks, Report Editor

This project was funded by the City of Richmond, services contract number 960, fiscal year 1988-89.

The following information is provided for your information and is not intended to be a substitute for professional advice.

* The purpose of this report is to provide information on the value of green trees in Richmond, Virginia. The report is based on a survey of 100 residents of Richmond, Virginia, who were asked to rate the value of green trees in their neighborhood on a scale of 1 to 5.

* The survey results show that the average rating for the value of green trees in Richmond, Virginia, is 4.2. This indicates that residents of Richmond, Virginia, value green trees highly.

* Proper maintenance of green trees is essential to their health and value. Regular watering, pruning, and fertilizing are all important aspects of tree care.

* There are many benefits to having green trees in your yard. Green trees provide shade, improve air quality, and increase property values.

* If you are considering planting a new tree, it is important to choose a species that is well-suited to your climate and soil conditions.

* All the trees shown in this report are of the same species and are of similar size and age.

RICHMOND

EXECUTIVE SUMMARY

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RICHMOND EXECUTIVE SUMMARY

Mission Statement:

- * To provide for the systematic maintenance of all public trees and to engage in an active planting program with the goal of creating attractive parks and tree lined streets throughout the city of Richmond.
 - * The planting of a minimum of 500 public trees per year. The ultimate goal is public tree population of 30,000.
-

The State of the Urban Forest in Richmond:

- * There are 10,478 street trees in the City of Richmond.
 - * There are 5,552 park or facility trees in Richmond.
 - * Of these over 16,000 trees, the majority of them are in poor condition and in need of pruning and/or removal.
 - * Of the tree species found, many of them are of species which do not perform well in the microclimates of Richmond.
 - * Except for selected areas of the city, many of these tree have received little or no maintenance.
 - * Weakened trees and limbs pose a serious liability threat to the city.
 - * There are no specific policies or procedures regarding the routine care or planting of public trees in the City of Richmond.
 - * The City of Richmond with its 250 miles of streets has a tree density of only 42 trees/mile of street, a little under 1/3 the national average.
-

The Value of Street Trees:

- * Street trees enhance the desirability of both residential and commercial streets, dramatically increasing property values 6-27%, and attracting business to the city.
- * Trees block the prevailing ocean winds, reducing heating costs and saving energy in the winter.
- * Trees reduce noise levels from traffic and other sources.

The Value of Street Trees, cont.:

- * Tree filter atmospheric pollutants, providing cleaner air.
- * They counteract the greenhouse effect by reducing excessive levels of carbon dioxide while adding beneficial oxygen to the atmosphere.
- * Street trees are worth caring for. An accepted value for a Chinese Pistache (Pistacia chinensis) with a 12 inch diameter in Richmond is approximately \$1500.
- * Properly maintained, these trees would naturally increase in value, and also would increase in economic benefit to the city.
- * Proper maintenance therefore is an investment not only in the trees themselves, it is also an investment in the community.

Recommendations:

- * The city should adopt a Street Tree Program, consisting of the following:

1. For City Staff--

Set up a five-year budget for adoption by city management and council, based on the summary information found in this report.

2. Planting Program--

Develop plans to plant trees in the parks and public right-of ways. Planting should occur by three means: First, through public works staff and contract tree planting. Secondly, through the development review/building permit process. Thirdly, through influence on redevelopment area planting criteria.

3. Maintenance Program--

Provide for systematic maintenance of park and street trees, providing for public safety as well as the health of the trees. At present, there is no budget for the park tree maintenance program.

4. Public Awareness Program--

Increase public awareness of trees as a valuable asset to the community. Encourage preservation and upkeep of existing trees. Promote new plantings. Discourage vandalism and neglect.

5. Sidewalk Safety Program--

The responsibility for repairing root-caused sidewalk damage should be shared by the city and property owners. Since 1980, records show that the City of Richmond has settled claims amounting to \$220,257 relating to the tripping hazards of raised sidewalks.

6. Ordinance Update--

Based on Council response to the proposed Urban Forest Program, staff should evaluate and update the ordinance accordingly.

7. PG&E Utility Line Clearance--

City staff should resolve line clearance operations within the city of Richmond in accordance with the recommendations found in this report.

Other Recommendations:

8. A Staff Position--

An Urban Forester/Arborist staff position should be considered to manage the community Urban Forest Program.

9. Contracting--

The city should continue to contract out maintenance activities and as much of the planting activities as possible.

10. Equipment--

There are three options for the tree care equipment owned by the city.

A. Retain the equipment for use in emergencies.

B. Make the equipment available to the contractor(s) doing planting and maintenance.

C. Sell the equipment.

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I. INTRODUCTION

CITY OF RICHMOND

Tree Inventory and Urban Forest Management/Master Plan

INTRODUCTION

The City of Richmond contracted with Thomas Pehrson and associates, including Barrie Coate, Horticultural Consultant, and Meachem O'Brian Landscape Architects, to provide a detailed inventory of all street and park trees, develop a comprehensive tree management program and prepare a long-range urban forest master plan. The purpose of the project was threefold:

1. To identify the location, composition, and condition of City-maintained trees;
2. Determine current maintenance needs of the trees; and
3. Develop a plan to perpetuate and increase the size of the City's urban forest.

During the inventory, a total of 10,478 street and 5552 park and facility trees were identified and inspected. The data collected from each street tree included street address, species, height, diameter, condition (infestations, diseases, manmade damages), and maintenance needs (type of pruning). Information regarding the physical constraints of each tree's growing space was also collected. This information included: size of planting area/cutout, and the presence of underground and overhead utility obstructions. The capture of this data was critical in selecting appropriate species for the 12,461 identified vacant planting sites.

Park and facility trees were treated separately from street trees. Park tree data collected included tree species, diameter and park location. A total of 5,552 park and facility trees were inventoried.

Climate

Richmond lies in a climate zone which is dominated by ocean influences much of the time. The climate is mild without extreme high or low temperatures and is characterized by cool, wet winters and cool summers with fog or wind. This climate type is characterized by Sunset Zones 17 (nearer the bay) and Zone 16 (interior).

Soils

According to the Soil Conservation Service's 1977 study of Contra Costa County, the soils of the central Richmond area are typified by the Tierra series and the Clear Lake series. The Tierra series consists of moderately well drained soils, mostly medium acid loams or clay loams. The Clear Lake series consists of poorly drained soils, most of

which are moderately alkaline clays.

The soils of Point Richmond are from the Millsholm series. These soils are medium acid loams. Rapid water runoff can be a problem in these soils.

The annex area of Richmond is composed mostly of cut and fill soil, that is, soil which has been modified with unknown materials and bears little resemblance to the natural soil in the area.

Multiple soils exist in the Hilltop area; Tierra loams are present as well as clay loams and clays. The slopes, varying from 15% to 30%, are greater here than in the central Richmond area.

Historical View of Richmond

Only one hundred years ago, the area now covered by the city of Richmond was ranch land with a few interspersed farmhouses and adobe homes. Richmond, along with San Pablo and El Cerrito, was a part of Rancho San Pablo.

In the time between Richmond's incorporation in 1905 to the present, the number of residents has increased dramatically. The population of street trees however, has not increased correspondingly.

Trees in Richmond

Trees planted along public right-of-ways and in parks soften the rough edges of the urban landscape and can help make Richmond a more pleasant place to live. Although street trees are an attractive addition to residential neighborhoods and commercial areas, they do impose a burden on city residents and municipal government. Trees need routine care and when they are neglected, they can be both unattractive and hazardous.

At present, 54% of the available planting sites in Richmond are vacant. A city beautification program that would aim to place trees in all these planting sites by the year 2000 would help foster a greater sense of community integrity and pride, as well as improve Richmond's appearance for decades to come.

Map of Major Geographical Areas

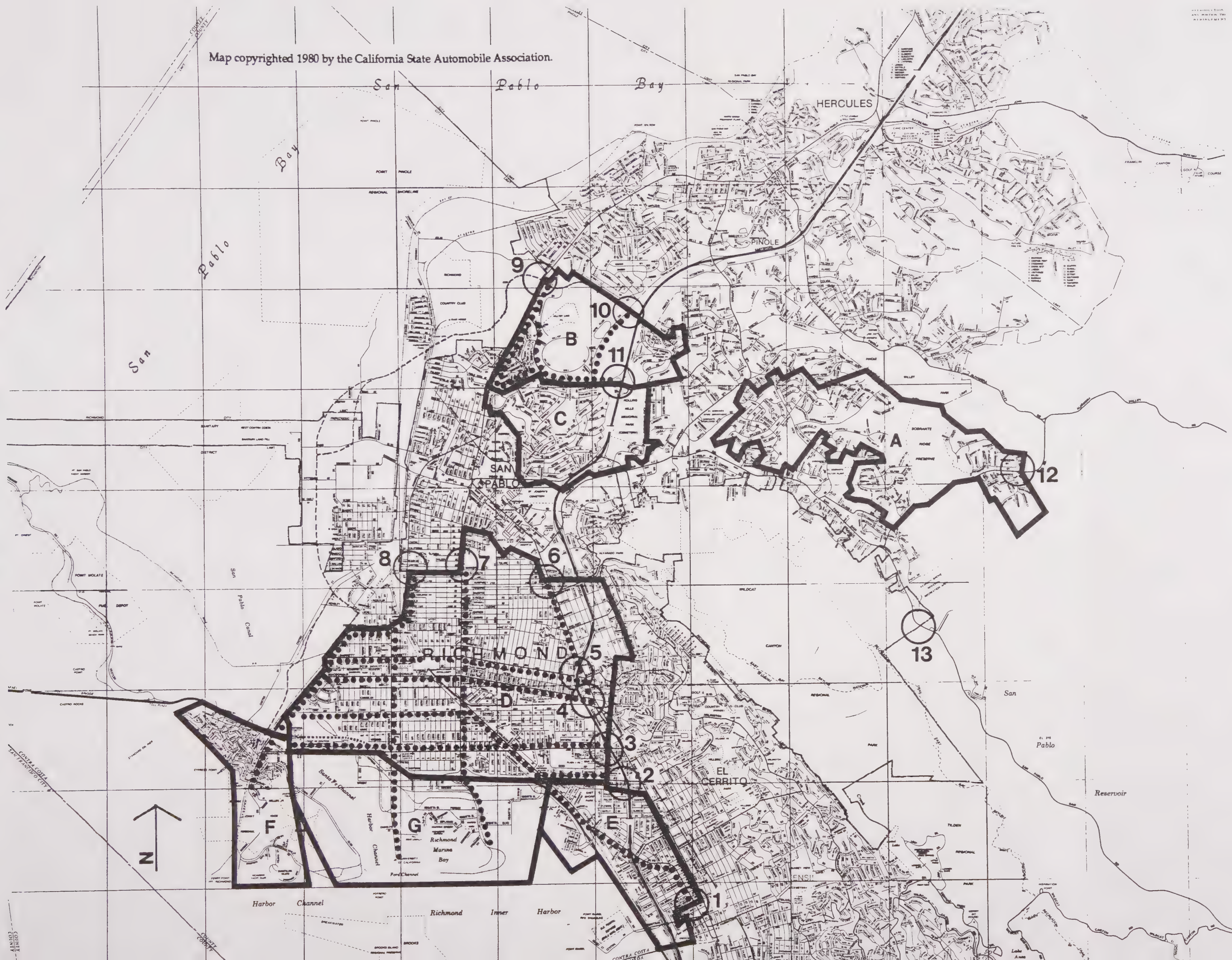
Map copyrighted 1980 by the California State Automobile Association.

Legend

- City Limit
- Proposed By-pass
- Major Thoroughfare
- 5 Key Gateway/Entry
- G Planting Zone

City of Richmond Urban Forestry Management/Master Plan

Planting Zones, Major Thoroughfares, and Entries



II. INVENTORY

CITY OF RICHMOND

Tree Inventory and Urban Forest Management/Master Plan

METHODS

Data was collected in the field using programmed Tandy Model 102 handheld computers. Nine different fields of data were collected as well as added comments where needed.

Tree Location

Trees were inventoried according to the street address and block face where they occurred. Trees were numbered within individual lots in the direction that addresses increased on the block face. Where addresses were not available, a fictional address was created. These addresses can be identified in the inventory by the extension "X" following the address number. Figure 1, on the next page, is a tree location diagram that illustrates the identification of street address.

Tree Identification

Trees were identified by their pertinent taxonomic category.

Diameter Classification

Diameter class data was collected as a means of determining relative ages of the various tree species as well as for assisting in the prioritization of maintenance activities. Tree diameters were estimated at 4.5 feet above ground level. Diameters were recorded by the following classes: 0-3", 3-6", 6-12", 12-18", 18-24", 24-30", 30-36" and greater than 36".

Height Classification

Tree heights were estimated and recorded by the following classes: 0-15', 15-30', 30-45', 45-60', and 60+ feet.

Tree Health Classification

Tree health was inspected and recorded by the following categories: vigorous, declining, or dead.

ADDISON ST.

s1	2101	2117	2125	2139	2151	18 2 5	f1
f1	f2	f1	f2	f1	f2	s1	s2

**MCKINLEY ST.
ADDRESSES INCREASING**

	s1	f1	f1	f1	f1	f1	f2	f3	
f2	1 8 2 2	2100	2116	2142	2174	2198X			s1
f1							1 8 1 3		f1
f2	1 8 0 4								
f1		2103	2109	2133	2167	2185			s2 s1
	s1	s2	s3	f1	f2	f1	f1	f2	f3

**GRANT ST.
ADDRESSES INCREASING**

	f1				s1		
f1	17 9 8	2100	2128	2160	2166	17 9 9	f1

ALLSTON WAY

Presence of Obstructions

1. Utilities - All locations with overhead utility wires were noted. Locations were noted as either containing high voltage (primary) wires or low voltage (secondary, telephone, or cable TV) wires.
2. Buildings or private trees - Interference of natural crown spread due to buildings or private trees were noted.
3. Water meters - Presence of water meter boxes less than 2 feet from any street tree was noted.

Site Description

The type of growing space; i.e. planting strip size, cutout, or set back from the sidewalk was noted for all trees. Planting strip width was recorded to the nearest 1/2 foot. Cutout size was given as length by width, measurements rounded to the nearest foot. Those trees set back behind the sidewalk and in the right-of-way were coded "99".

Vacant Planting Sites

In accordance with current spacing practices and species selection, all locations that represented a vacant site were recorded. Vacant sites were defined as follows:

1. Minimum planting strip width:
2.5 feet, minimum sidewalk width: 6.5 feet
2. Spacing:
 - a. Conform to existing pattern, or
 - b. Use approximately 30 feet on center spacing.
3. Intersections:
 - a. 25 feet approaching intersection
 - b. 25 feet exiting intersection
4. Minimum Clearance:

a. Driveway	10 feet
b. Fire Hydrant	10 feet
c. Manhole or Utility vault	5 feet
d. Telephone or other pole	5 feet
e. Parking meters	5 feet

f. Gas and Water meters	5 feet
g. Sewer vents	5 feet

Vacant sites were identified where there were existing planting strips and where planting strips had once existed and had been cemented in. These were the only places evaluated for sites.

Special Designations

Parks and Facilities:

Parks and Facilities were inventoried by species, and by size class. They were all address-indexed by Park or Facility name, rather than street address.

Map Area A.

El Sobrante:

Only street and parking strips were inventoried. Most of the El Sobrante area has sidewalk/curb construction without planting strips, and therefore very few public trees exist in the area.

Map Area B.

Hilltop Shopping Area:

The interior shopping area parking lot (Parcels #42, 43, 49, 50, 51, 53) was inventoried in the same manner as the Parks and Facilities. The remainder of the Landscape Maintenance District, exterior to the parking lot, was inventoried by parcel numbers, not addresses. No trees were inventoried in the Hillview development or the Hilltop Green development. Only trees in Hilltop Green Park were inventoried, using the Parks and Facilities method. Atlas Road was inventoried by street addresses.

Map Area C.

The Residential Area of Hilltop:

These were inventoried in the standard manner, by addresses. A large part of this area has no planting strips, except for certain Modesto Ash planted in the Groom Drive/MacKenzy Drive area.

Map Area D.

Central Richmond:

These were inventoried in the standard manner, by addresses.

Map Area E.

Richmond Annex:

These were inventoried in the standard manner, by addresses.

Map Area F.

Point Richmond:

Much of this area is semi-rural. The areas inventoried were those with sidewalks, curbs, medians, parks, and planting strips.

Map Area G.

Marina:

In this largely industrial district, the areas inventoried were the areas with planting strips. On Marina Bay Parkway, the large plantings of Eucalyptus lehmanii, Acacia melanoxylon, and Cupressus macrocarpa which are in the median strip were entered using the Parks and Facilities methodology. Marina Park Green and its parking lots, as well as the Harbor facilities were also inventoried in this manner.

Maintenance Classifications

Determination of maintenance needs was accomplished by technically qualified personnel. The collection of inventory information was based upon visual inspection and did not involve individual testing or analysis. The actual condition of inventoried material may not have been apparent and therefore may not have been recorded.

All trees were classified for one or more of the following:

1. Pruning - Trees were either rated as "high" prune or "medium" prune based on a combination of:
 - a. Their structural pruning requirements.
 - b. Their obstruction of roadway, pathway, or signage.

In general, trees rated as high prunes were large trees needing structural work as well as requiring clearance for road, pathway, or signage. Medium prune/trunks were those trees either smaller statured or having minor clearance or structural problems.

2. Immediate prune - was assigned to those trees which pose potential liability risks through large hangers, large or excessive deadwood, or visible decay.
3. Stump Removal - stump removal was assigned to existing stumps in the right of way.

4. Tree Removal - removal was assigned to those trees which are in a state of severe decline indicated by dieback or extensive deadwood and which cannot be cost effectively restored to a vigorous condition.

TREE SPECIES FREQUENCY

Street Trees, Overall

Species diversity is relatively low in Richmond. Although the 10,478 inventoried street trees in Richmond represent 147 different species, most of the street trees in Richmond are concentrated in just a few species. Figure 2, a species frequency report, shows the occurrence of the ten most frequently occurring species found in Richmond in descending order of appearance. Table A-1 in Appendix A contains the complete species frequency report for all street trees in Richmond.

The five most frequently occurring tree species in Richmond comprise 44% of the street tree population while the top nine species account for 56% of the population. The most frequently occurring street tree in Richmond is Ulmus parvifolia with 1465 trees accounting for 14% of the entire population of trees in the city. The next most frequent species is Platanus acerifolia, 1311 (12%); followed by Cinnamomum camphora, 700 (6%); Myoporum laetum, 689 (6%); Prunus cerasifera, 657 (6%); Magnolia grandiflora, 535 (5%); Liquidambar styraciflua, 406 (3%); Melaleuca linariifolia, 301 (2%); and Photinia fraseri, 227 (2%).

Street Trees, by Map Area

Map Area A.

El Sobrante:

There are 198 public trees here, all concentrated on only three streets: Morningside Drive, May Road, and Valley View. There were 60 vacant sites identified. Planting strips do not exist in El Sobrante other than the streets mentioned. Existing and potential private landscaping in this area should provide the required tree cover, although this should be monitored and planting encouraged. The five major species are:

1. Chinese Elm (Ulmus parvifolia)
2. Monterey Pine (Pinus radiata)
3. California Pepper Tree (Schinus molle)
4. Washington Hawthorn (Crataegus phaenopyrum)
5. Holly Oak (Quercus ilex)

Map Area B.

Hilltop Shopping Area (Includes Hilltop Mall, Hilltop Green, and Hillview):

Hillview and Hilltop Green are residential areas and there are no public right-of-way for street trees in these areas. The trees of the Hillview neighborhood are maintained by a homeowners association. The Hilltop Mall area is in a special Landscape

Maintenance Assessment District, which provides for planting and maintenance of the publicly owned trees.

In the area surrounding the Hilltop Shopping Mall, there are a total of 1011 public street trees, and only 12 vacant planting sites. Five species predominate:

1. Sycamore (Platanus acerifolia)
2. Shamel Ash (Fraxinus uhdei)
3. Eucalyptus nicholii
4. Black Acasia (Acacia melanoxylon)
5. Eucalyptus globulus

Hilltop Drive, and the freeway off-ramp form the major entry point into Richmond's Hilltop Mall. Unfortunately, landscaping and plant performance in the conditions of this area have been less than optimal. The off-ramp and the median strips in the Drive are completely devoid of any landscaping. Some very large Eucalyptus trees lining the Drive are in serious need of attention, stressed because of the harsh clay soil and constant wind. It is in this entry area that the city has an opportunity to develop a exemplary demonstration project in cooperation with CalTrans (See report "Entry Points").

Map Area C.

Residential Area of Hilltop

There are 356 public street trees in this part of Richmond, and 453 vacant sites. There is also a great deal of root-caused sidewalk damage from the Chinese Elm and the Mulberry trees. Monolithic sidewalk curbs dominate. The top five tree species in this area are:

1. Ash (Fraxinus velutina 'Glabra')
2. Chinese Elm (Ulmus parvifolia)
3. White Mulberry (Morus alba)
4. Monterey Pine (Pinus radiata)
5. Myoporum laetum

Map Area D.

Central Richmond:

Except for the redeveloped area around West Macdonald Avenue, this area has an extremely low density of public street trees. There are 9934 public street trees and 6912 vacant sites. The opportunities for planting here are considerable, especially with the generous planting strip widths found here. The top five species are:

1. Chinese Elm (Ulmus parvifolia)
2. London Plane Tree (Platanus acerifolia)

3. Myoporum (Myoporum laetum)
4. Camphor (Cinnamomum camphora)
5. Purple Leaf Plum (Prunus cerasifera)

Map Area E.

Richmond Annex:

There are approximately 1406 trees in this region of Richmond and 1898 vacant sites. This represents a higher density of trees than in Central Richmond, but there are still many vacant spaces for new trees. There appears to be a concentration of sidewalk damage in this area, primarily caused by the Camphor trees. The five major species are:

1. Chinese Elm (Ulmus parvifolia)
2. Camphor (Cinnamomum camphora)
3. Purple Leaf Plum (Prunus cerasifera)
4. London Plane Tree (Platanus acerifolia)
5. Southern Magnolia (Magnolia grandiflora)

Map Area F.

Point Richmond:

There are 498 public street trees in Point Richmond, and 172 identified individual vacant sites. Street trees in this area are largely limited to the commercial section. The five major species of public trees in Point Richmond are:

1. London Plane Tree (Platanus acerifolia)
2. Chinese Elm (Ulmus parvifolia)
3. Prunus spp.
4. Monterey Pine (Pinus radiata)
5. Liquidambar (Liquidambar styraciflua)

Map Area G.

The Richmond Marina Area:

There are fewer than 100 street trees in this recently redeveloped area. There are, however, several hundred park trees. A median strip exists on the Marina Parkway, and there are some public tree plantings along Harbour Way. The bulk of the public trees in this area are found in the Marina Green and near the Richmond Public Boat Ramp. The five most frequently found street tree species are:

1. Leyland and Monterey Cypress (Cupressus macrocarpa)
2. Chinese Elm (Ulmus parvifolia)
3. Eucalyptus rudis

4. Eucalyptus lehmannii
5. Black Acasia (Acacia melanoxylon)

Although these species tolerate the soil conditions of the Marina area, they have been planted far too densely for their optimal health. Both structural and disease problems (especially incurable coryneum canker fungus in the Cypress trees) will occur with these trees over time because of these conditions.

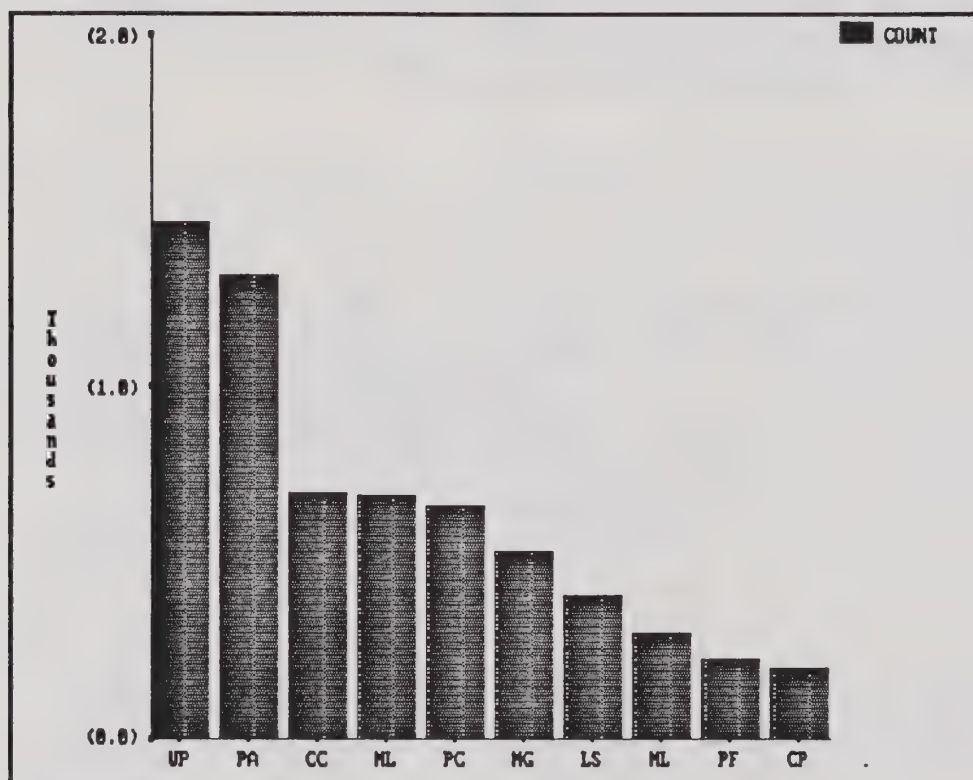
Park and Facility Trees

The 5552 inventoried park and facility trees were distributed between 106 different species. Five species account for 42% of these trees while the top ten species account for over 61% of this population. Figure 3 is a species frequency report for the top ten species found in Richmond's parks and facilities. Table A-2 in Appendix A reports tree species in descending order of appearance.

The most frequently found park and facility tree is Cupressus macrocarpa with 676 trees inventoried, accounting for 12% of the park tree population. The next most frequently occurring species, in decreasing order, are Pinus radiata, 507 (9%); Alnus rhombifolia, 498 (9%); Fraxinus uhdei, 356 (6%); Eucalyptus camadulensis, 300 (5%); Platanus acerifolia, 244 (4%); Eucalyptus globulus, 240 (4%); Acacia melanoxylon, 228 (4%); Cupressocyparis leylandii, 209 (4%); and Pinus halepensis, 149 (3%).

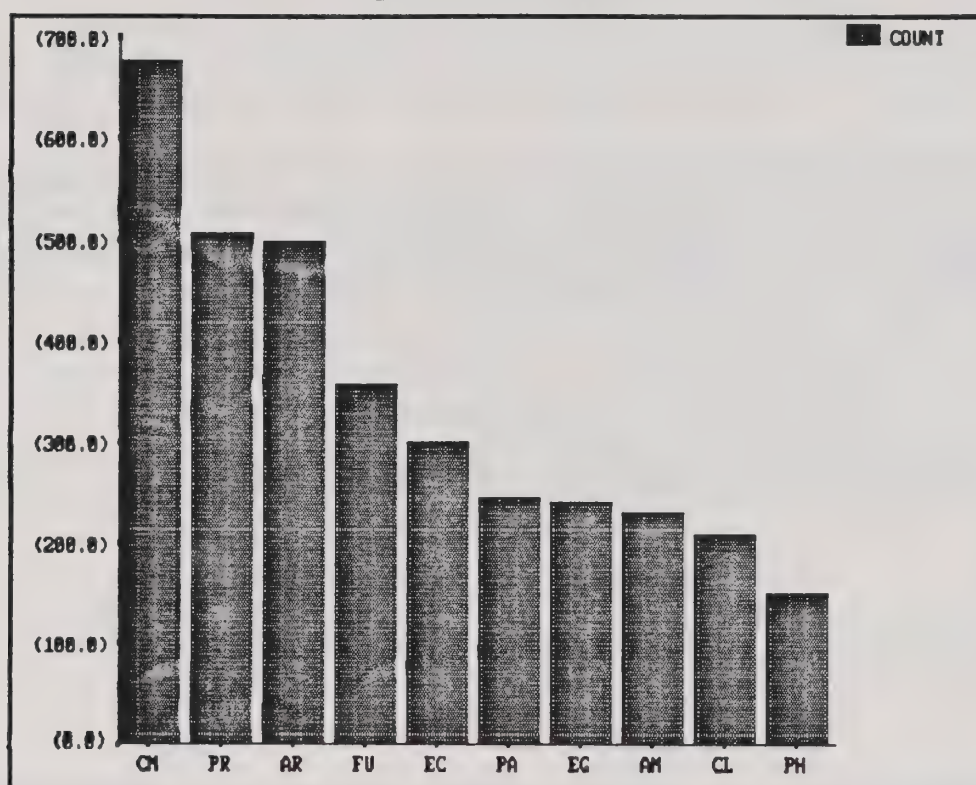
It should be noted that while the three most frequent species, i.e., Monterey cypress, Monterey Pine and White Alder, are indicative of the types of trees commonly planted in the newer parks of Richmond, the large numbers of Evergreen Ash and Aleppo Pine are somewhat misleading. The majority of these two species can be found in only one general location, the Hilltop Shopping Center area.

FIGURE 2 STREET TREE SPECIES FREQUENCY REPORT
TOP 10 SPECIES



<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>COUNT</u>	<u>%</u>
<u>Ulmus parvifolia</u>	Chinese Elm	1465	14.00
<u>Platanus acerifolia</u>	Sycamore, London Plane	1311	12.50
<u>Cinnamomum camphora</u>	Camphor	700	6.68
<u>Myoporum laetum</u>	Myoporum	689	6.58
<u>Prunus cerasifera</u>	Purple Leaf Plum	657	6.27
<u>Magnolia grandiflora</u>	Southern Magnolia	535	5.11
<u>Liquidambar styraciflua</u>	Liquidambar	406	3.88
<u>Melaleuca linariifolia</u>	Flaxleaf Paperbark	301	2.87
<u>Photinia fraseri</u>	Photinia	227	2.17
<u>Crataegus phaenopyrum</u>	Washington Hawthorn	201	1.92

FIGURE 3 PARK & FACILITIES SPECIES FREQUENCY REPORT
TOP 10 SPECIES



<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>COUNT</u>	<u>%</u>
<u>Cupressus macrocarpa</u>	Monterey Cypress	676	12.20
<u>Pinus radiata</u>	Monterey Pine	507	9.13
<u>Alnus rhombifolia</u>	White Alder	498	8.97
<u>Fraxinus uhdei</u>	Shamel Ash	356	6.41
<u>Eucalyptus camaldulensis</u>	Red Gum Eucalyptus	300	5.40
<u>Platanus acerifolia</u>	Sycamore, London Plane	244	4.39
<u>Eucalyptus globulus</u>	Blue Gum Eucalyptus	240	4.32
<u>Acacia melanoxylon</u>	Blackwood Acacia	228	4.11
<u>Cupressocyparis leylandii</u>	Leyland Cypress	209	3.76
<u>Pinus halepensis</u>	Aleppo Pine	149	2.68

SIZE DISTRIBUTION OF TREES

Street Trees

Richmond's street tree population is heavily represented in the smaller diameter classes. Over 94% of the trees in Richmond's public right-of-ways are 18" or smaller in diameter. Only 1.3% of the street trees are over 24" in diameter. Table 1 below displays the diameter frequency distribution of Richmond's street trees.

TABLE 1

DIAMETER DISTRIBUTION OF STREET TREES

<u>DBH Class</u>	<u>Count</u>	<u>Percentage</u>
0 - 3"	2308	22.0
3 - 6"	2399	22.9
6 - 12"	3334	31.8
12 - 18"	1832	17.5
18 - 24"	472	4.5
24 - 30"	82	0.8
30 - 36"	29	0.3
36+"	<u>21</u>	<u>0.2</u>
	10,477	100.0

Roughly 45% of Richmond's street trees are less than 6" in diameter. The preponderance of smaller diameter trees reflects the planting of smaller statured trees in the past such as hawthorn, plums, and photinia as well as the recent planting of larger statured trees.

Table B-1 in Appendix B shows the distribution of all species found in Richmond by

diameter class. Approximately 85% of the Chinese Elms planted in public right-of-ways are between 6-18" in diameter while close to 50% of the Sycamores are less than 6" in diameter. Over 60% of the Camphor trees are over 12" in diameter. Only Sycamore, Camphor, Myoporum, Flax-Leaf Paperbark, Black Acacia and Red-Flowering Gum have significant numbers (more than 20 individuals) of trees over 18" in diameter.

Park and Facility Trees

The diameter distribution of Richmond's park and facility trees is similar to that found for street trees. Most of the trees have small diameters, with 79% of the park and facility trees having diameters smaller than 12". An even higher proportion, 36%, of these trees are in the 3-6" diameter category than that found among street trees.

Table 2 below shows the diameter distribution of park and facility trees in Richmond. Table B-2 in Appendix B shows the diameter distribution by species of all trees found in Richmond's parks.

TABLE 2

DIAMETER DISTRIBUTION OF PARK AND FACILITY TREES

<u>DBH Class</u>	<u>Count</u>	<u>Percentage</u>
0-3"	984	17.7
3-6"	1996	36.0
6-12"	1399	25.2
12-18"	742	13.4
18-24"	309	5.6
24-30"	80	1.4
30-36"	41	0.7
36+"	<u>1</u>	<u><0.1</u>
	5552	100.0%

TREE MAINTENANCE RECOMMENDATIONS

This section analyzes the removal, pruning, and planting requirements noted during the inventory. Recommendations for future action are included under each maintenance requirement. The incidence of tree-related sidewalk damage is also discussed, along with recommendations for preventative measures for future plantings.

A summary of maintenance requirements noted during the inventory can be found in Table 3 below.

TABLE 3

STREET TREE MAINTENANCE FREQUENCY REPORT

<u>Maintenance Activity</u>	<u>Frequency</u>	<u>Percentage</u>
Stump Removal	297	3.0
Hi-Prune	438	3.8
Immediate Prune	25	0.2
Tree Removal	839	8.0
Medium Prune/Train	8878	85.0

The best and most efficient way to abate liability regarding public trees is to perform routine maintenance with informed and qualified personnel. Utilization of the updatable computerized tree inventory system included as part of this project can be an invaluable tool in this process.

The extended amount of time during which the City of Richmond has neglected to perform maintenance activities for its street trees has resulted in a tree population requiring an initially large effort to bring all trees to a state where only routine, scheduled maintenance work is needed.

Although the total amount of work confronting the city staff may appear to be overwhelming, the work can be prioritized in order to operate within a realistic annual departmental budget. The most important task which must be accomplished is the removal of the dying, diseased, and structurally unsafe trees.

Removals

A total of 839 trees were recommended for removal. Tree removal represented 8% of all street trees inventoried. Of these removals, 337 (40.2%) were less than 6" in diameter. There were 373 (44.5%) removals in the 6-12" size class, the single largest group of removals of all diameter classes. In the 12-18" diameter class, 97 (11.6%) removals were recommended; 27 (3.2%) removals were in the 18-24" class; 4 (0.5%) removals were in the 24-30" size class.

The majority of 12-18" diameter trees recommended for removal are Chinese Elms. By itself, Chinese Elms account for over 67% of this size class. The decline in the health of many of these trees are the result of infection by the Gnomonia fungus, commonly known as Anthracnose, which causes cankers or open lesions and wounds in the main bole and branches of infected trees. The location of the cankers, often on the trunk and scaffold branches, the pendulous growth habit of the branches as well as poor tree structure due to past pruning practices combine to make these trees a hazard to the public.

A complete listing of trees needing removal by street address is in Appendix C. Table C-2 in Appendix C details the removals by species and diameter class.

Stump Removals

A total of 297 stumps were inventoried by field staff. Most likely, the stumps are the result of unauthorized removal of city trees by private residents. Some of the stumps are quite high, a few feet above ground while others are barely visible above ground level but need to be removed to allow room for new plantings. The stumps need to be cut low and ground. Table C-3 in Appendix C displays stump locations by street address.

Hi Prune

Trees identified as needing Hi-prunes showed the characteristics of prolonged neglect. Usually these trees also had clearance problems and will need crown raising as well as crown restoration work. There are 438 trees in this category.

Safety Prune

Trees identified as safety prunes need immediate pruning to reduce dense crown growth or dangerous, diseased limbs and should be taken care of as part of the first priority of work. There are 25 of these trees. Table C-4 in Appendix C displays the street address of those trees needing immediate pruning.

Pruning/Training

The remaining 8878 trees, or 85% of the City's street tree population also need pruning on a routine basis. Their needs are not as immediate as the previous categories but both routine thinning as well as some major crown restoration needs to be done on these trees. Of these trees, 1845 are young staked trees. These young trees can benefit over their entire lifespan by proper training over the next maintenance cycle. Training young trees helps develop a central trunk and strong branching structure.

Tree-related Sidewalk Damage

In general, the rate of root growth varies with tree species and size, soil conditions, surface covering, rainfall, and irrigation practices. Proper root development is essential for healthy trees. However, evaluation of root-caused sidewalk damage by inventory personnel indicates that tree roots in Richmond are causing severe problems.

Twenty-one percent of the street trees in Richmond have caused sidewalk damage. The incidence of future root-caused sidewalk damage can be reduced if the factors leading to damage are understood and measures are taken to mitigate them.

The four most important factors causing sidewalk damage are as follows:

1. Planting in narrow parkways: Eighty-five percent of the street trees causing sidewalk damage are in planting strips 6.5 feet in width or less. Although 21% of the trees in planting strips 2' or less in width have caused sidewalk damage, smaller stature trees as well as those species with deep rooting characteristics have been planted in these smaller planting sites, moderating the incidence of damage. In contrast, only 7% of the trees in planting sites equal to or wider than 10 feet have caused sidewalk damage, and only 4% of the trees planted behind the sidewalk have caused sidewalk damage. Table 4 on the following page displays the distribution of sidewalk damage across planting sites of different widths.

TABLE 4

SIDEWALK DAMAGE LOCATION REPORT

<u>Width of Planting Site</u>	<u>Total Tree Count</u>	<u>SW Damage Count</u>	<u>% SW Damage</u>
1.0-2.0'	405	87	21.0
2.5-4.0'	3275	619	19.0
4.5-6.5'	3883	1106	28.0
7.0-9.5'	986	219	22.0
>9.5'	613	42	7.0
planted behind SW	1202	53	4.0

2. Species selection: Seventy-eight percent of the tree-caused sidewalk damage in Richmond was caused by just 10 species. Forty-four percent of the tree-caused sidewalk damage was caused by Chinese Elms and Camphor trees. With the exception of Sycamore and Purple Leaf Plums, the top ten sidewalk damaging trees have shallow root systems. Chinese Elm and Camphor each caused roughly 22% of the root-caused sidewalk damage, followed by Sycamore with 8.33%, Myoporum (7.76%), Southern Magnolia (4.94%), Melaleuca (3.62%), Ash (2.96%), Purple Leaf Plum (2.31%), Liquidambar (2.11%), and Black Acacia with 1.98%. The other species planted in public right-of-ways in Richmond each accounted for less than 2% of the tree-caused sidewalk damage.

Table 5 on the next page displays the incidence of root-caused sidewalk damage by species.

TABLE 5

TREE SPECIES CAUSING SIDEWALK DAMAGE

<u>Species</u>	<u>Count</u>	<u>% of SW Damage Caused by Species</u>
<u>Ulmus parvifolia</u>	473	22.25
<u>Cinnamomum camphora</u>	466	21.92
<u>Platanus acerifolia</u>	177	8.33
<u>Myoporum laetum</u>	165	7.76
<u>Magnolia grandiflora</u>	105	4.94
<u>Melaleuca linariifolia</u>	77	3.62
<u>Fraxinus velutina</u> 'glabra'	63	2.96
<u>Prunus cerasifera</u>	49	2.31
<u>Liquidambar styraciflua</u>	45	2.11
<u>Acacia melanoxylon</u>	42	1.98

Table C-5 in Appendix C displays trees causing sidewalk and/or curb or gutter damage by species and diameter class.

3. Tree size: Generally speaking, larger diameter trees are more likely to cause sidewalk damage. Data collected in Richmond supports this. Although trees in all diameter classes caused some sidewalk damage, trees in the larger diameter classes caused proportionally more damage. While only 3% of the trees in the 0-3" DBH category caused sidewalk damage, 54% of the trees with diameters between 24-30" caused sidewalk damage. Additionally, 75% of the tree-caused sidewalk damage was caused by trees between 6-18" in diameter and 90% of the tree-caused sidewalk damage was caused by trees over 6" in diameter.

Table 6 which follows displays the incidence of tree-caused sidewalk damage by diameter class. The total number of trees per diameter class is in

the first column, followed by the number of trees causing sidewalk damage by diameter class, the fraction of trees per diameter class causing damage and the fraction of sidewalk damage caused by trees by diameter class.

Ninety-six percent of the Chinese Elms and 98% of the Camphor trees causing sidewalk damage were 6" in diameter or greater.

TABLE 6
DIAMETER DISTRIBUTION OF TREES CAUSING SIDEWALK DAMAGE

<u>Diameter</u>	<u>Total #</u>	<u># Causing SW Damage</u>	<u>% DBH Class Causing SW Damage</u>	<u>% SW Damage Caused by Trees in DBH Class</u>
0-3"	2308	61	3	3
3-6"	2399	150	6	7
6-12"	3334	769	23	36
12-18"	1832	835	46	39
18-24"	472	252	53	12
24-30"	82	44	54	2
30-36"	29	10	34	<1
36+ "	21	2	10	<1

4. Soil characteristics: The Tierra soils series in central Richmond and Hilltop generally promote moderate rooting, while the Clear Lake series in central Richmond and the Millsholm series in Point Richmond are less conducive to deep rooting, and may in places force shallow rooting. The cut and fill soils in the annex vary, with drainage characteristics differing throughout the area.

Appendix D contains maps which display the locations of tree-caused sidewalk damage in Richmond. Methods for controlling root-caused sidewalk damage are discussed in the Section III. Management Report.

PRUNING STANDARDS

The following pruning standards are provided as both a basis for any in-house work the City of Richmond conducts as well as for inclusion in any contract pruning the City may undertake. These pruning standards were developed by the Western Chapter of the International Society of Arboriculture (ISA) and adopted by the Executive Committee on May 18, 1988. Permission to reprint the pruning standards and the pruning diagrams was obtained from the Western Chapter of the ISA.

I. Pruning Techniques - General

- A. A thinning cut removes a branch at its point of attachment, or shortens it to a lateral large enough to assume the terminal role. Thinning opens up a tree, reduces weight on heavy limbs, can reduce a tree's height, distributes ensuing invigoration throughout a tree, and helps retain the tree's natural shape. Thinning cuts are therefore preferred in tree pruning.

When shortening a branch or leader, the lateral to which it is cut should be at least one-half the diameter of the cut being made. Removal of a branch or leader back to a sufficiently large lateral is often called "drop crotching."

- B. A heading cut removes a branch to a stub, a bud, or a lateral branch not large enough to assume the terminal role. Heading cuts should seldom be used because vigorous, weakly attached upright sprouts are forced just below such cuts, and the tree's natural form is altered. In some situations, branch stubs die or produce only weak sprouts.
- C. When removing a live branch, pruning cuts should be made in branch tissue just outside the branch bark ridge and collar, which are trunk tissue (See Pruning Figure 1). If no collar is visible, the angle of the cut should approximate the angle formed by the branch bark ridge and the trunk (Pruning Figure 2).
- D. When removing a dead branch, the final cut should be made outside the collar of live callus tissue. If the collar has grown out along the branch stub, only the dead stub should be removed, the live collar should remain intact, and uninjured (Pruning Figure 3).
- E. When reducing the length of a branch or the height of a leader, the final cut should be made just beyond (without violating) the branch bark ridge of the branch being cut to. The cut should approximately bisect the angle formed by the branch bark ridge and an imaginary line perpendicular to the trunk or branch cut (Pruning Figure 4).

- F. A goal of structural pruning is to maintain the size of lateral branches to less than three-fourths the diameter of the parent branch or trunk. If the branch is codominant or close to the size of the parent branch, thin the branch's foliage by 15% to 25%, particularly near the terminal. Thin the parent branch less, if at all. This will allow the parent branch to grow at a faster rate, will reduce the weight of the of the lateral branch, slow its total growth, and develop a stronger branch attachment. If this does not appear appropriate, the branch should be completely removed or shortened to a large lateral (Pruning Figure 5).
- G. On large-growing trees, except whorl-branching conifers, branches more than one-third the diameter of the trunk should be spaced along the trunk at least 18 inches apart, on center. If this is not possible because of the present size of the tree, such branches should have their foliage thinned 15% to 25%, particularly near the terminals (Pruning Figure 6).
- H. Pruning cuts should be clean and smooth with the bark at the edge of the cut firmly attached to the wood.
- I. Large or heavy branches that cannot be thrown clear, should be lowered on ropes to prevent injury to the tree or other property.
- J. Wound dressings and tree paints have not been shown to be effective in preventing or reducing decay. They are therefore not recommended for routine use when pruning.

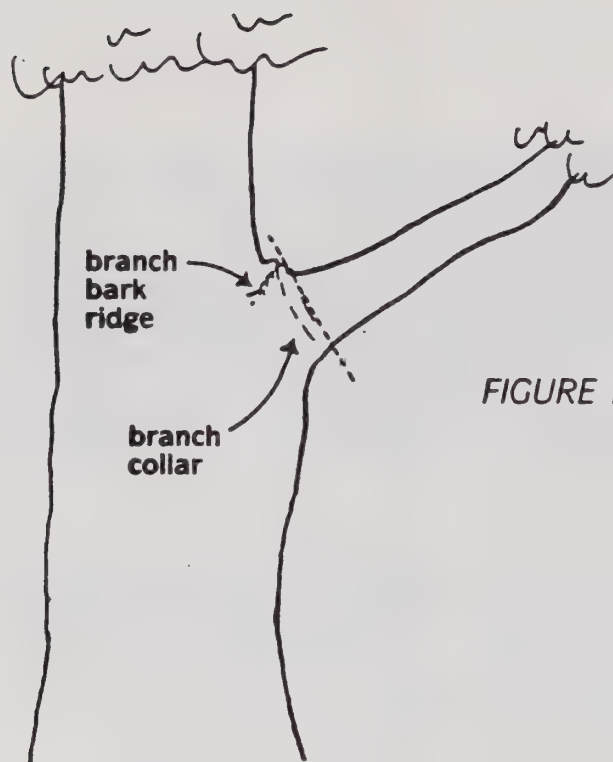


FIGURE 1. When removing a branch, the final cut should be just outside the branch bark ridge and collar.

FIGURE 2. In removing a limb without a branch collar, the angle of the final cut to the branch bark ridge should approximate the angle the branch bark ridge forms with the limb. Angle AB should equal Angle BC.

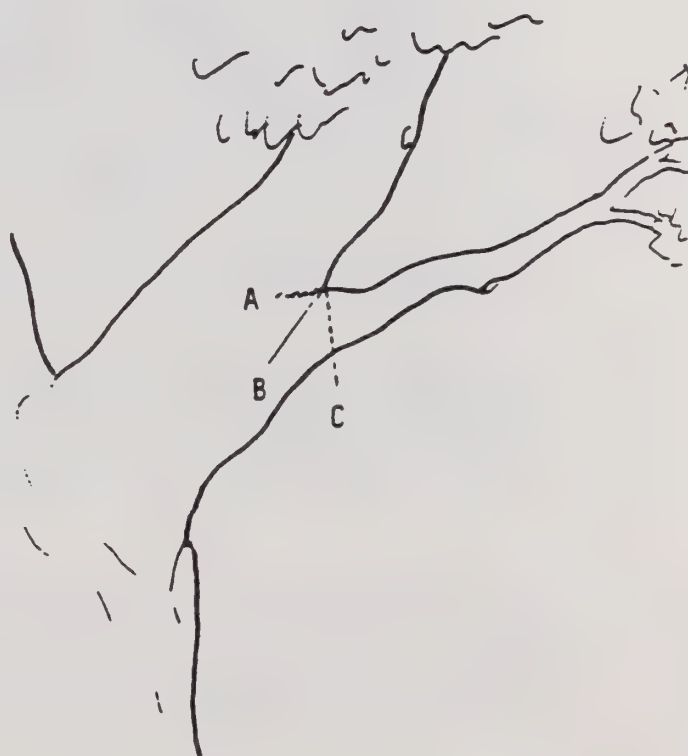


FIGURE 3. When removing a dead branch, cut outside the callus tissue that has begun to form around the branch.

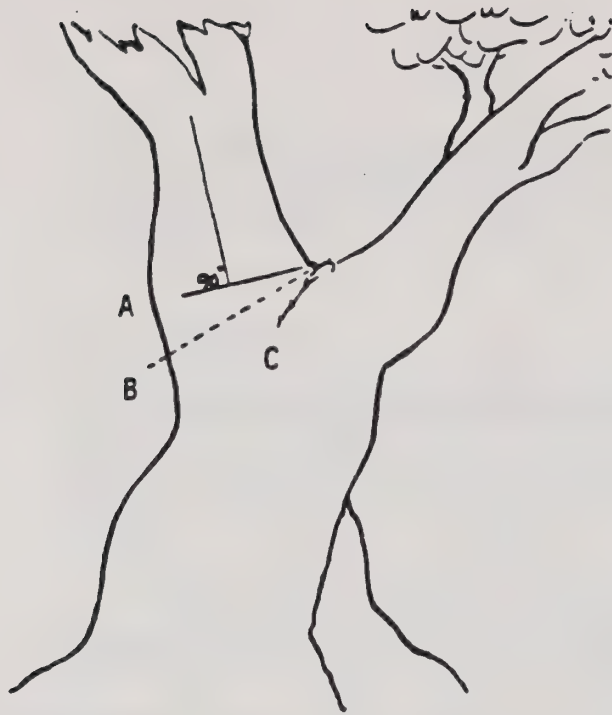
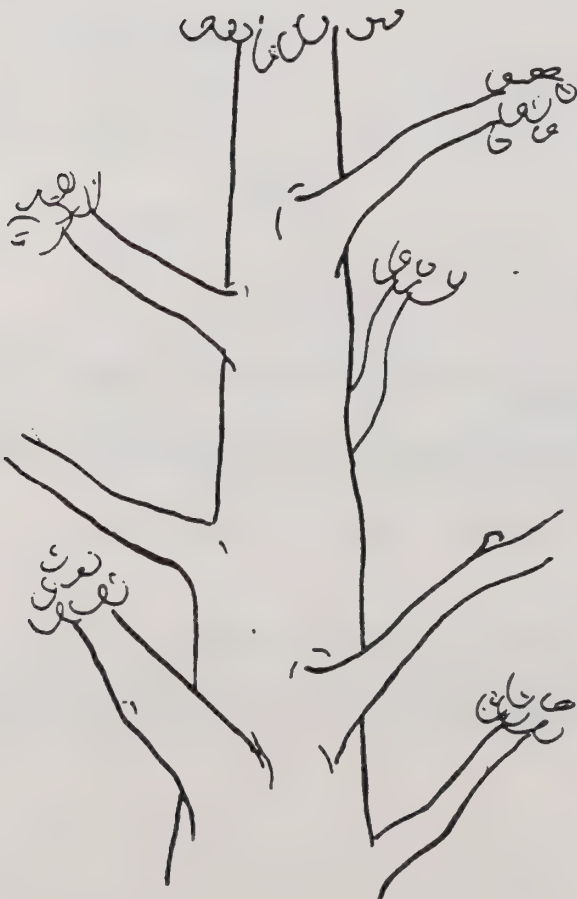


FIGURE 4. In removing the end of a limb to a large lateral branch, the final cut is made along a line that bisects the angle between the branch bark ridge and a line perpendicular to the limb being removed. Angle AB is equal to Angle BC.

FIGURE 5. A tree with limbs tending to be equal-sized, or codominant. Limbs marked B are greater than $\frac{3}{4}$ the size of the parent limb A. Thin the foliage of branch B more than branch A to slow its growth and develop a stronger branch attachment.



FIGURE 6. Major branches should be well spaced both along and around the stem.



II. Types of Pruning - Mature Trees

A. Crown Cleaning

Crown cleaning or cleaning out is the removal of dead, dying, diseased, crowded, weakly attached, low-vigor branches, and watersprouts from a tree crown.

B. Crown Thinning

Crown thinning includes crown cleaning and the selective removal of branches to increase light penetration and air movement into the crown. Increased light and air stimulates and maintains interior foliage, which in turn improves branch taper and strength. Thinning reduces the wind-sail effect of the crown and the weight of heavy limbs. Thinning the crown can emphasize the structural beauty of trunk and branches as well as improve the growth of plants beneath the tree by increasing light penetration. When thinning the crown of mature trees, seldom should more than one-third of the live foliage be removed.

At least one-half of the foliage should be on branches that arise in the lower two-thirds of the tree. Likewise, when thinning laterals from a limb, an effort should be made to retain inner lateral branches and leave the same distribution of foliage along the branch. Trees and branches so pruned will have stress more evenly distributed throughout the tree or along a branch.

An effect known as "lion's-tailing" results from pruning out the inside lateral branches. Lion's-tailing, by removing all the inner foliage, displaces the weight to the ends of the branches and may result in sunburned branches, watersprouts, weakened branch structure and limb breakage.

C. Crown Reduction

Crown reduction is used to reduce the height and/or spread of a tree. Thinning cuts are most effective in maintaining the structural integrity and natural form of a tree as well as delaying the time when it will need to be pruned again. The lateral to which a branch or trunk is cut should be at least one-half the diameter of the cut being made.

D. Crown Restoration

Crown restoration can improve the structure and appearance of trees that have been topped or severely pruned using heading cuts. One to three sprouts on main-branch stubs should be selected to reform a more natural appearing

crown. Selected vigorous sprouts may need to be thinned to a lateral, or even headed, to control length growth in order to ensure adequate attachment for the size of the sprout. Restoration may require several prunings over a number of years.

E. Crown Raising

Crown raising removes the lower branches of a tree in order to provide clearance for buildings, vehicles, pedestrians, and vistas. It is important that a tree have at least one-half of its foliage on branches that originate in the lower two-thirds of its crown to ensure a well-formed, tapered structure and to uniformly distribute stress within a tree.

When pruning for view, it is preferable to develop "windows" through the foliage of the tree, rather than to severely raise or reduce the crown.

III. Size of Pruning Cuts

Each of the Pruning Techniques (Section I) and Types of Pruning (Section II) can be done to different levels of detail or refinement. The removal of many small branches rather than a few large branches will require more time, but will produce a less pruned appearance, will force fewer watersprouts and will help to maintain the vitality and structure of the tree. Designating the maximum size (base diameter) that any occasional undesirable branch may be left within the tree crown, such as 1/2", 1" or 2" branch diameter, will establish the degree of pruning desired.

IV. Climbing Techniques

- A. Climbing and pruning practices should not injure the tree except for the pruning cuts.
- B. Climbing spurs or gaffs should not be used when pruning a tree, unless the branches are more than throw-line distance apart. In such cases, the spurs should be removed once the climber is tied in.
- C. Spurs may be used to reach an injured climber and when removing a tree.
- D. Rope injury to thin barked trees from loading out heavy limbs should be avoided by installing a block in the tree to carry the load. This technique may also be used to reduce injury to a crotch from a climber's line.

V. Young Tree Maintenance: Young tree pruning.

1. Round headed, slow to moderate growth rate trees as Camphor, Coast Live Oak, Carob, Callery Pears.
 - a. At planting time:
Remove 1/3 of branches in the "skirt" (between soil level and the permanent branches). Select the largest diameter of these branches to remove. Leave the balance well distributed up and down and around the trunk. Tip the balance of branches in the skirt by 10% of their length. Remove all opposite branches on trunk or in crown in this process.
 - b. At 2 years of age:
Remove 1/2 of remaining branches in skirt as above.
Select main scaffold limbs, remove competing limbs in crown of equal diameter to those scaffold limbs. Remove all opposite branches on trunk or in crown in this process. Thin the balance of the crown up to 20% of foliage.
Remove stake.
 - c. At 3 years of age:
Remove remaining branches in skirt.
Perform a crown reduction.
2. Round to oval upright trees of very fast growth, as Evergreen Ash, Eucalyptus species, Brisbane Box.
 - a. At planting time:
Remove 1/3 of branches in the "skirt" (between soil level and the permanent branches). Select the largest diameter of these branches to remove. Leave the balance well distributed up and down and around the trunk. Tip the balance of branches in the skirt by 10% of their length.

Select main scaffold limbs in crown, remove competing limbs in crown of equal diameter to those scaffold limbs. Remove opposite branches. Thin the balance of the crown to remove up to 10% of the remaining foliage. Remove all opposite branches on trunk or in crown in this process.
 - b. At 1 year of age:
Remove 1/2 of remaining branches in skirt as above.
Further select main scaffold limbs as above, and remove closely spaced competitive branches, aim for distribution of main limbs spaced evenly around the trunk, and at least 8-12" apart on the trunk.

- c. At 2 years of age:
Perform a crown reduction.
- 3. Deciduous, pyramidal trees, as Liquidambar and Armstrong Red Maple.
 - a. At planting time:
Remove 1/4 of side branches over the full height of the tree. Select the branches to remove as those with the largest diameter leaving the balance well distributed up and down the trunk and around it. Remove opposite branches. Remove or reduce by 3/4 and co-dominant leaders. Tip remaining branches by 10% of their length, including those just below the leader.
 - b. At 2 years of age:
Remove or reduce co-dominant leader. Tip remaining branches by 10%. Reduce limbs which protrude beyond canopy.
 - c. At 3 years of age:
Remove 1/3 of branches in lower skirt up to levels necessary for vehicular or pedestrian clearance. Tip remaining side branches up to the same height by 20% of their length.
 - d. At 4-5 years:
Lift entire crown for clearance as needed.
- 4. Broom style trees as Zelkova, Elms, Celtis, Geijera.
 - a. At planting time:
Select main scaffold branches which will all be clustered near one point on the trunk. Remove up to 1/3 of main branches, leaving scaffold branches distributed as far apart as possible. Tip branches in skirt
 - b. At 2 years of age:
Remove 1/2 of branches on trunk. Selecting the largest diameter ones to remove, leaving balance evenly distributed up and down the trunk. Tip remaining branches by 10% of their length. Remove crossing limbs.
 - c. At 4 years of age:
Perform crown thinning as required.
- 5. Coniferous trees.
 - a. At planting time:
Tip side branches by 10% of their length.

- b. At 1 year old:
Remove 1/3 of branches over entire height of tree if increased height is the goal. Select these branches as the largest diameter ones, leaving the balance evenly distributed up and down and around the trunk. Tip the remaining branches by 10% of their length.
- c. Perform a crown thinning if needed.

III. MANAGEMENT REPORT

CITY OF RICHMOND

Tree Inventory and Urban Forest Management/Master Plan

REVIEW OF TREE ORDINANCE

Chapter 10.08 of the municipal code for the City of Richmond provides for the trimming, pruning, care, planting, removal and moving of trees, shrubs or plants on city property. It outlines the authority of the City to regulate vegetation on city property. It is clearly written and should be comprehensible to the public.

The tree ordinances of American cities vary tremendously in breadth of coverage and level of detail specified. Richmond's ordinance covers issues common to other urban areas, and in a manner similar to that adopted by many other cities. While some cities have ordinances that contain detailed descriptions of management activities and standards, other cities leave managers with more discretion to develop standards and guidelines on their own. Richmond's ordinance leaves considerable discretion to city staff to set standards. This approach can be advantageous in that the greater flexibility it provides allows them to develop standards that reflect actual conditions in the city. When conditions change, the standards can be adjusted more readily than if they were codified in municipal statutes.

Similarities between Richmond's ordinance and those of a selected sample of other cities include:

1. The broad duties and responsibilities of the Superintendent for the care of trees on city property;
2. Permit requirements for planting, pruning and other work on existing trees in public right-of-ways;
3. Prohibition of actions that damage trees;
4. Measures to protect trees during construction;
5. Authority to inspect and remove hazardous trees on public property.

There are some differences between Richmond's ordinance and those of selected other cities. Those differences include:

1. In Richmond's ordinance, no height standard for trees overhanging streets and sidewalks is set for either public or private trees;
2. There is no discussion in the Richmond ordinance, of the private property owner's responsibility regarding trees planted in public right-of-ways. In some cities, the private property owner or resident is responsible for normal care such as minor debris control, raking leaves, watering, etc. and that responsibility is made explicit in the ordinance. It would be useful to state exactly what the adjacent property owner's responsibilities for trees in public right-of-ways is.

3. In Richmond, the responsibility for paying the replacement cost of a tree removed because it was diseased, hazardous, responsible for property damage or endangered public safety lies with the property owner whose property abuts the public property where the tree removal occurred (section 10.08.120). Although private property owners must pay for afforestation, it seems unfair to require them to pay for replacement when the cause for the tree's decline may have been neglect, poor species selection for the site (both which could be direct city responsibility) or disease. Requiring a property owner to pay the replacement cost for a tree removed when actions by the property owner caused the problem would be another matter.
4. Richmond's ordinance does not include a method for appraising the value of trees for replacement or damage. The International Society of Arboriculture (ISA) guidelines for establishing the value of landscape plants provides an accepted method for doing this.
5. Most city ordinances begin with a section on definitions. Although no such section is contained in Richmond's ordinance, it may not be a problem. Only city staff would know whether this has caused problems in the past.
6. Richmond's ordinance does not contain a statement of policy regarding trees. Many other city ordinances contain a policy statement concerning afforestation, tree preservation, beautification, etc. that formalizes the official policy of the city regarding trees on public property. Such a policy statement can be useful in that it provides a direction for city staff. Management activities undertaken by staff must be supported by, or in conformance with the city's policy.
7. Historic or heritage trees are not recognized in Richmond's ordinance.
8. There is no discussion of penalties for violations of the Richmond ordinance.
9. Many cities provide for the preparation of a master tree plan in their ordinances. Obviously there was no need of such discussion in Richmond's ordinance for preparation of a master tree plan to occur.
10. Richmond's ordinance contains no description of tree spacing on public right-of-ways. Additionally, there is no mention of a list of permissible species and prohibited species. Some cities provide for such a list in their ordinance, while others leave the staff to decide whether such a list is needed. Given the discretion given the Parks and Recreation Director in other matters concerning trees, these omissions are consistent with the ordinance.

Richmond's tree ordinance is comprehensible and covers most of the issues of greatest concern. The discretion given to city staff to make decisions and set standards is probably viewed as advantageous to staff. Ultimately, the best evaluation of the ordinance can be made by both city staff and the residents of Richmond. If staff is having difficulties enforcing the ordinance, or believes there are inconsistencies or omissions that merit revision, a more thorough review of the ordinance is needed. If however, the ordinance appears to be a good working document and is not creating problems, no revisions appear to be needed at this time.

PROPOSED STREET TREE PROGRAM

Richmond's municipal codes give the Public Works Director responsibility for planting, trimming, pruning and caring for all trees on any street or park within the city. A successful street tree program must have specific policies and procedures for tree planting, maintenance, and public involvement. The just-completed inventory of trees planted within public right-of-ways will provide foundation for a complete tree maintenance program. The following program guidelines are suggested for the City of Richmond Street Tree Program.

I. Tree Planting Program

A. Policy

1. Plant trees within the public right-of-ways to develop and maintain attractive tree-lined streets throughout the City of Richmond. A planting goal of a minimum of 500 trees/year has been identified. When resources are available, additional planting should be done. The long term street tree population goal for the City of Richmond is 25,000 total trees.

B. Procedures

1. Number of Trees per property.

Generally, two trees are planted on a mid-block lot, or four on a corner lot. Each location varies, however depending on the following factors:

- a. Recommended spacing for selected tree species given mature dimensions (Minimum spacing is 20 ft.);
- b. Proximity to street intersections and traffic control devices;
- c. Existing trees, shrubs, fences, and obstructions;
- d. Driveways, sidewalks, curbs and gutters;
- e. Length of frontage;
- f. Utilities (overhead and underground).

2. Locations trees are planted.

- a. In the city easement, behind the curb and gutter or sidewalk, or where trees are reasonably well-protected from traffic.
- b. In all new residential developments and in new or rehabilitated commercial, industrial, or institutional developments. Street trees will be planted according to the City of Richmond Landscape Design and Development Guidelines.
- c. In existing residential neighborhoods based upon individual requests received throughout the year and based upon recommendations received from Neighborhood councils.
- d. Along major boulevards through Department of Public Works Capital Improvement Projects.
- e. Where trees have died or have been damaged because of accidents, or storms. Trees that have died from resident neglect (such as not assisting in tree watering or letting planting areas become overgrown with competing vegetation) will not be replaced.

3. Time of tree planting.

November, December, January.

4. Resident assistance.

- a. Residents are asked to water newly planted trees.
- b. Residents are also asked to keep grass, ivy, and groundcovers away from the base of newly planted trees.
- c. Residents are asked to repair any damage to supporting tree stakes.

II. Tree Maintenance Program

A. Policy

- 1. To provide periodic residential street tree maintenance on trees located within the city right-of-way between the street and the property line, based upon the following factors:

- a. Public Safety.
- b. Growth rate and structure of individual tree.
- c. Time elapsed since last trimming.
- d. Geographic location.

B. Procedures

1. Maintenance services provided for City Street trees are:

a. Tree pruning

Trees are pruned to develop proper structure, improve health and vigor by deadwood removal, and for clearance of obstructing branches or foliage for pedestrians, bicycles, and vehicles. The intent of the trimming program is to prune trees for safety and health rather than cosmetic appearance. It is Public Works Department policy NOT to pollard or top street trees because of the overall negative effect of these practices.

2) Tree Removal

Dead, diseased or structurally unsafe City trees, including stumps that have been declared a public nuisance are removed by the City. In other cases, where application is made to remove a healthy tree, consideration will be based on the following factors:

- a. The proximity of proposed structures and interference with utility service;
- b. The proposed removal's effect on the topography, erosion, soil retention, and the diversion or increased flow of surface waters;
- c. The number of healthy trees or landscape materials which the parcel of land will support in consideration of standard arboricultural practices;
- d. The number of trees existing in the neighborhood and the effect of tree removal upon property values, public health, prosperity, beauty and general welfare of the area.

If the removal of a healthy tree is approved, the expense of tree and stump removal shall be borne by the applicant.

3) Pest Management

Department policy is to minimize the use of pesticides and use them only when other methods have not controlled the disease or pests.

4) Cabling and bracing

Based upon evaluation by Public Works personnel, the structurally corrective techniques of cabling and bracing may be employed.

5) Root pruning and Root-caused sidewalk damage

Root pruning is done when tree roots are damaging City-owned improvements including sidewalks, curb and gutter, and sewers or storm drains. The goal of the street tree program is to repair all severe root-caused sidewalk damage. Priority of repair locations will be based on severity of lift in combination with sidewalk traffic use.

6) Emergency response

The City will respond to a safety hazard when a public tree is involved.

III. Public Awareness program

A. Policy

1. Increase the public awareness of trees as a valuable asset to the community. Encourage preservation and upkeep of existing trees while promoting new plantings throughout the City. Reduce the incidence of vandalism and neglect.

B. Procedures

1. Plan and present a series of slide-show presentations at local schools to thwart tree vandalism.
2. Conduct a series of public informational meetings throughout the city to inform the public of the City's street tree program and how residents can become involved (See #4, 6, 11 of this section). Publicize the meetings in local papers, including foreign language dailies or weeklies if they are published and/or distributed in Richmond.
3. Post notices or distribute flyers in neighborhoods where tree work is scheduled

to inform residents of the work in advance. These flyers should be in English, as well as the appropriate foreign languages.

4. Prepare news releases on a regular basis on a variety of topics. The news releases should be topical. For example, a December article could feature information on pruning fruit trees, while summer watering schedules could be discussed in June or July. Other topics could include a discussion of the city's and the property owner's responsibility for street tree establishment and care, tree selection for different sites in Richmond, non-scientific natural histories of various trees commonly planted in Richmond, and why tree planting in Richmond makes sense. The articles should be lively and readable, with photos and graphics. Again, these releases should be in English, as well as the appropriate foreign languages.
5. Develop a list of projects for volunteers. Develop projects suitable for groups of various skill levels such as Boy and Girl Scout troops, as well as senior citizen groups. Publicize the list in the papers. Plan an awards ceremony when the project has been completed. Presentation of a certificate of recognition is sufficient. Invite the press to the ceremonies.
6. Develop a slide talk for City staff to present to civic groups and membership organizations (Rotary, Lions, Soroptimist, BPW, Girl and Boy Scout troops, environmental groups, garden clubs etc.) that meet on a regular basis in Richmond. Develop a new talk every year or two to take to the public. At the end of the slide program, introduce the list of volunteer projects (4) and encourage the group being addressed to tackle one of the projects. An excellent way to get started on these slide talks is to enroll in the Natural Resources Communications workshop presented by Dr. Jon Hooper, Department of Parks and Recreation at Chico State University. He presents a workshop annually in January in Chico, but also does workshops around the state at other times of the year. Call him at (916) 895-5811 at Chico State for more information.
7. Set up a fund for private contributions for tree planting and tree enhancement work. Publicize the fund.
8. Organize events on Arbor Day. Set up tree planting or tree care projects and arrange to have school children carry out these projects on Arbor Day. Notify the press. Arbor Day is also a good occasion for poster contests for school children. Sponsor a city-wide poster contest for the 4th, 5th or 6th graders. Provide informational materials on Arbor Day for the teachers' use. Select a theme for the poster contest. Display the top posters at City Hall or some other public place.

9. Set up a demonstration project that illustrates the benefits of trees in the urban environment. Erect signs that explain the demonstration project.
10. Explore how to obtain recognition as a "Tree City, USA" and pursue it if feasible.
11. Put on periodic tree planting, tree care, tree watering, etc. demonstrations for the public. These demonstrations could be done in cooperation with area garden clubs. Publicize the demonstrations.
12. Designate one member of each Neighborhood Council in Richmond to function as the tree coordinator for the neighborhood which he or she represents. The tree coordinator will be responsible for working with City staff to determine which public right-of-ways would benefit by tree planting and whether or not property owners and residents are interested in having trees planted.
13. Inform the public that the Public Works Department is available to work with neighborhood groups to develop tree planting projects.

STREET TREE MAINTENANCE MANAGEMENT PROGRAM

The 10,478 trees lining Richmond's city streets represent a substantial value to the city. While many city expenditures involve capital investment in projects that decline in value over time, an investment in tree care and tree planting is an investment in an asset that increases in value as the tree grows and matures. The five year management budget that follows is based on the results of the 1989 inventory. We recommend that the City of Richmond and its citizens accept this plan as the basis for future city forestry activities.

While the Director of Public Works is charged with the responsibility for planting, trimming, pruning and caring for all trees on streets and in parks within the city, the Director's responsibilities are too broad to attend to the details presented in this report. We therefore recommend that either a new position for an Urban Forester/Horticulturist be created, or the services of an urban forestry consultant be used to implement this plan.

The information collected in the inventory and presented earlier in this report indicates that overall tree diversity was low with several problem species in high concentrations. Maintenance requirements were found to be very high due to inadequate tree care in the recent past.

This plan is intended to serve as a guide. It establishes tree management priorities, budget estimates and scheduling based on inventory results.

Maintenance Priorities

It is recommended that the City of Richmond implement a program of systematic tree care. This program will allow the city to realize the full potential of its urban forest through the most cost effective use of tree care funding.

A. Street Trees

First Priority work requirements include those trees that are currently creating potential safety problems. These include the following categories, large (>12"dbh) tree removals, large (12"dbh) stump removals, and trees in need of safety pruning. Trees in need of these maintenance operations should be corrected in year one of the systematic tree care program. There are 128 tree removals needed, 111 stump removals and 25 trees requiring safety pruning.

Second Priority work requirements include those trees identified as high priority prunes and those tree species that have rapid growth characteristics. It is recommended that a four-year cycle be implemented for slower growing species and a two year trim cycle for faster growing species. In this way all trees will be pruned on a routine basis thereby lessening the chance of future liability and increasing their health and appearance. Trees identified as requiring a two year trim cycle are:

<u>Species</u>	<u>Numbers of Trees</u>
Chinese Elm	1478
Myoporum	668
Gum Eucalyptus	126
Mulberry	120
Pepper	80
Fig	46
Ash (Shamel)	<u>33</u>
	2551

The number of two year prunes should decrease over time as work proceeds on the 366 recommended Chinese elm removals.

All other second priority prunes should be place on a four-year trim cycle. The combination of one-half the two year trees and one-fourth the four year trees would create a total goal of 3039 trees serviced per year.

B. Park Trees

First Priority work includes those parks and facilities with concentrations of problematic species such as Cupressus macrocarpa, Cupressocyparis leylandii, Acacia melanoxylon, or Eucalyptus species. Priority should be given to large size class trees of these species. Parks and facilities with large numbers of these trees are as follows:

Eastshore Park
Crescent Park
Hilltop Green Park
Nicholl Park

ROOT-CAUSED SIDEWALK DAMAGE

Since 1980, records show that the City of Richmond has settled claims amounting to \$220,257 relating to the tripping hazards of raised sidewalks. We recommend that the City assume responsibility for initiating cooperative efforts with residents to correct sidewalk damage caused by trees in the public right-of-ways. Without such an effort, further incidents caused by damaged sidewalks is inevitable, as is resident initiated litigation against the City.

The following table represents the frequency of root-caused pavement damage and the tree species most responsible for this damage in the City of Richmond.

<u>Damage Type</u>	<u>Count</u>
Minor lifts (less than or equal to .5 inch)	731
Lifts (.5 inch to 1.0 inch)	659
Major lifts (more than 1.0 inch of lift)	422
Temporary repaired minor lifts	12
Temporary repaired lifts	69
Temporary repaired major lifts	155
Curb damage	137
Road damage	25
 <u>Top Ten Tree Species Causing Damage</u>	 <u>Count</u>
Chinese Elm	473
Camphor	466
Sycamore	177
Myoporum	165
Magnolia	105
Melaleuca	77
Ash	63
Purple Leaf Plum	49
Liquidambar	45
Black Acacia	42

Methods for Controlling Root-Caused Sidewalk Damage

There are six methods for controlling root growth damage that are feasible for the City of Richmond. They include:

1. Root prune - Roots are either pruned by hand or with the aid of a root pruning machine, 12 to 24 inches below grade on sidewalk or curbside. Use of the root pruning machine is more cost effective but can result in severing large

anchor roots. Root pruning is effective but must be repeated on a 3-4 year cycle to control resprouting of severed roots.

2. Root prune with barriers - Roots are pruned as in #1 above, but a plastic barrier of variable depth is installed to force roots down. This method can be very effective providing the barrier is deep enough and the environment for root growth is suitable at the greater depth. It has been shown in experiments at the University of California at Davis that roots will resurface after going under the barrier but that the cycle between subsequent root prunings should be lengthened. A cost of \$7.00/linear foot has been quoted for root pruning and barrier installation.
3. Herbicide treatment - In sidewalk reconstruction areas an herbicide may be mixed in with base materials under cement. Compounds with Dichlobenil have been used for their root-inhibiting effect although are not recommended for use in light sandy soils.
4. Design modification - In areas where the amount of growing space is severely restricted, the technique of bowing sidewalks or gutters in conjunction with the above controlling methods has had successful results.
5. Material changes - The use of materials other than concrete which are more flexible and are less expensive to maintain is another alternative in solving the sidewalk damage problem. Decomposed granite and asphalt have been tried, but have met with resistance by the public due to their non-traditional appearance.
6. Elimination of planting strips - Tree removal and sidewalk-curb reconstruction of a monolithic design. This alternative would put trees into areas less restricted but would involve large scale reconstruction.

GUIDELINES FOR COORDINATION WITH UTILITY COMPANIES

I. PG&E's Tree Removal and Replacement Program

Pacific Gas & Electric Company (PG&E), the utility company servicing the City of Richmond, has an existing tree replacement program whereby PG&E jointly works with cities, counties and individuals to remove fast-growing trees under power lines and replace them with slower-growing species. PG&E is responsible for the removal of the city-designated trees, grinding of the stumps, acquisition of new trees and the planting of these trees. The city, in turn, must provide a dump site for the tree debris resulting from the removals. PG&E's East Bay Regional Electric Department (which includes Richmond), has created a Tree Trimming video that introduces and explains the company's tree removal and replacement or relocation programs to interested parties.

The agreement between PG&E and a tree owner such as the City of Richmond to remove and replace problematic trees must clearly specify each party's responsibilities in the joint effort. Each removal and replacement project is treated differently by PG&E, as such, Richmond must negotiate wisely with PG&E's personnel to achieve the city's tree management objectives.

Examples of the Removal/Replacement Program in Cities

Past joint efforts between PG&E and East Bay cities have been handled in various ways depending on the existing political and geographical conditions. In the City of San Lorenzo, PG&E removed 700 sycamores with the permission of the homeowners, cut and stacked the firewood from these trees, provided stump grinding, bought 15-gallon replacement trees and planted these trees. In the City of Newark, 578 eucalyptus trees were removed by PG&E. PG&E purchased 667 replacement trees; the trees were chosen from a list of seven species provided by the city. In this case, PG&E did not split and stack firewood from the removed trees nor plant the replacement trees; the city of Newark planted the trees.

The City of Richmond has recently completed a pilot tree removal and replacement program in conjunction with PG&E. Forty-three eucalyptus trees on Harbour Way, south of the John Knox Freeway, were removed. PG&E ground the stumps, removed the wood debris, and coordinated with the California Conservation Corps to plant the 15 replacement trees provided by PG&E with the species being selected by the City.

The Future of the Removal/Replacement Program

PG&E is actively pursuing ways to increase the budget for its tree removal and

replacement program. Although it will not be known until later this year if the Public Utilities Commission grants this allocation of funds, projects are currently being negotiated between PG&E tree trimming coordinators and staff of various cities in PG&E's service territory.

Site Selection

The results of PG&E's tree removal and replacement program benefit both the City of Richmond and PG&E. The city can begin to provide tree cover which is appropriate for specific sites while the utility company can save time and money in not trimming fast-growing trees under its power lines as frequently.

-- PG&E's Perspective

From the perspective of PG&E, the types of sites which would be attractive candidates for inclusion into the tree removal and replacement program would be sites where ownership of the existing trees is under one organization, for instance, a city; the trees are or will soon be interfering with high voltage lines; the power is not scheduled to be placed underground.

-- The City of Richmond's Perspective

From the city's viewpoint, it could take advantage of PG&E's program by selecting sites which not only had fast-growing trees on it but, also had trees which were causing considerable sidewalk damage. Other sites which would satisfy the utility's and city's objectives would be areas with tree species deemed undesirable due to poor structure, limited growing space, susceptibility to diseases or insects, or changes in the overall planting design for the city.

Negotiations Between PG&E and the City of Richmond

Clearly, both parties, i.e., PG&E and the City of Richmond, want to receive as many benefits from the removal/replacement program as possible. The sites with many problematic trees under power lines which PG&E would like to remove might not necessarily be the same sites the city is interested in addressing at that time. In this case, the city would have a greater advantage in its negotiating position with PG&E. Rather than merely allowing PG&E to remove the designated trees, remove the debris and replace trees from PG&E's tree list, the city might be able to negotiate with PG&E to remove additional trees which are also under power lines but, are not immediate potential causes of service interruptions; this would allow for uniform plantings to occur. Other services the city might be able to procure from PG&E include: grinding stumps, splitting and stacking firewood from the removed

trees, reseeding lawn areas, installing root barriers, procuring replacement trees from the city's list of desirable trees, and planting more trees than were removed.

Using the Inventory Data

By looking at the inventory data for target problem trees under primary lines and then their locations, it is possible to identify sites which should be visited by city staff as well as PG&E personnel and identified as potential candidates for the removal and replacement program.

II. City Influences on PG&E Tree Trimming Methods

While it may appear the cities have little control over how PG&E conducts its tree trimming to attain the needed clearance between tree obstructions and high voltage lines, there are ways in which cities and other organizations can influence PG&E's trimming practices.

Line Clearance Requirements

Depending on the voltage being carried by the power lines, PG&E is legally required to maintain between four to fifteen feet of clearance from its lines and any obstructions. Obviously, it is to its advantage if PG&E can obtain greater clearance than the legal minimum in order to lengthen the trim cycle length. Some cities such as Rocklin and Hayward allow PG&E to remove only enough tree mass to achieve six feet of clearance between the tree and the power lines. Even individual homeowners, such as one in Vacaville, may restrict PG&E to only four feet of clearance thus requiring PG&E to return every year or even every eight months to trim the poplars under the lines.

Tree Trimming Methods

Restrictions on clearance between city-owned trees and utility lines are commonly specified in the city's tree ordinance or a similar document. Some cities such as San Lorenzo go even further in dictating how PG&E trims its trees by specifying the method of tree trimming. This city requires PG&E to employ the "roundover" method of tree trimming. The San Lorenzo Homeowner's Association requires PG&E to abide by this requirement as well. It is recommended the City of Richmond require PG&E to prune trees according to the International Society of Arboriculture pruning guidelines.

Good working relationships between city staff and PG&E as well as PG&E tree

trimming contractors are needed for city tree trimming specifications to be realized. The city staff person who usually is the utility company's contact for any tree related questions is the public works director, or the city arborist.

At present, the tree trimming coordinator for the Bay Division of PG&E is Bill Wolf. Mr. Wolf coordinates the tree removal and replacement program in addition to overseeing the tree trimming operations for the PG&E lines within Richmond and other cities. He and the tree trimming company which has been contracted to provide services to PG&E would have to be consulted if there are requirements which the City of Richmond plans to implement in its tree management plan.

In the interest of keeping the city streets tree-lined while avoiding tree-caused power outages, it is suggested that areas which contain primary utility lines and concentrations of known fast-growing, tall, invasive trees such as Eucalyptus, Liquidambar, Tulip tree, Lombardy Poplar and Black Acacia, be targeted for removal and replacement through PG&E's program. These trees should be in groups large enough to minimize travel and maximize onsite labor and equipment. In general, this number should be at least ten.

By looking at the inventory data for the target trees under primary lines and then their locations, it is possible to identify sites which should be visited by city staff as well as PG&E personnel and marked for potential removal and replacement.

IV. MASTER TREE PLAN

CITY OF RICHMOND

Tree Inventory and Urban Forest Management/Master Plan

TREE SPECIES SELECTION

Selecting the right species for a given location can do much to reduce future maintenance costs and control city liability. Tree planting is a long-term commitment by the city to the beauty of the community and requires periodic maintenance to protect the public and ensure the greatest benefits. Since municipal budgets are increasingly stretched, it is important that tree species chosen for municipal planting be as free of problems and the necessity for frequent pruning as possible. One of the best ways to minimize those costs is to use only species or selected cultivars which are specifically chosen for their preference for the environmental conditions in which they must grow. In other words, a well adapted tree will have far fewer disease and insect problems and have a much longer useful life.

Cities throughout the state use essentially the same palette of tree selections repeatedly. The variety of trees available and suitable for the urban environment far exceeds what is seen. The reason for this is that municipal tree managers only plant what is currently made available from nurseries. With advance notification, several nurseries would be willing to grow many of the less commonly produced trees described in Appendix E.

Although planting conditions vary substantially throughout Richmond, a generalized tree list has been prepared, with species suitable for conditions found in much of the city. The tree species in the list below were analyzed for foliage characteristics, microsite condition requirements, root zone management practices, flower and fruit occurrence, nursery status, and growth and stature. They are recommended for planting in Richmond. Appendix E contains a detailed description of each tree species.

Tree Species Suitable for Richmond

<u>Acer campestre</u> *	<u>Eucalyptus gunnii</u>
<u>Acer nigrum</u> 'Green Column'	<u>Eucalyptus microtheca</u> *
<u>Acer pseudoplatanus</u> *	<u>Eucalyptus parvifolia</u> *
<u>Acer rubrum</u> 'Armstrong'	<u>Eucalyptus polyanthemus</u>
<u>Acer rubrum</u> 'October Glory'	<u>Fraxinus americana</u>
<u>Aesculus carnea</u>	<u>Fraxinus</u> 'Moraine'
<u>Alnus cordata</u>	<u>Fraxinus oxycarpa</u>
<u>Angophora costata</u> *	<u>Geijera parviflora</u>
<u>Betula nigra</u>	<u>Ginkgo biloba</u>
<u>Betula nigra</u> 'Heritage'	<u>Koelreuteria bipinnata</u>
<u>Carpinus betulus fastigiata</u> *	<u>Koelreuteria paniculata</u>
<u>Carpinus caroliniana</u> *	<u>Laurus x</u> 'Saratoga'
<u>Celtis australis</u>	<u>Magnolia grandiflora</u> 'Russet'
<u>Celtis sinensis</u>	<u>Magnolia grandiflora</u> 'St. Mary'
<u>Cinnamomum glanduliferum</u> *	<u>Melaleuca linariifolia</u>
<u>Eucalyptus ficifolia</u>	<u>Melaleuca quinquenervia</u>

Melaleuca styphellioides*
Metrosideros excelsus
Nyssa sylvatica*
Pinus canariensis
Pistacia chinensis
Platanus acerifolia 'Yarwood'
Prunus caroliniana
Pyrus calleryana
Quercus agrifolia
Quercus robur*
Quercus suber
Quercus virginiana
Robinia pseudoacacia
 'Umbraculifera'*
Sapium sebiferum
Sophora japonica
Sophora japonica 'Regent'*
Tilia americana 'Redmond'*
Tilia cordata 'Chancellor'*
Tristania conferta
Tristania laurina

* Denotes an experimental tree, which has not been tested in Bay Area cities, but which is suited to Richmond's planting conditions.

Monocultures

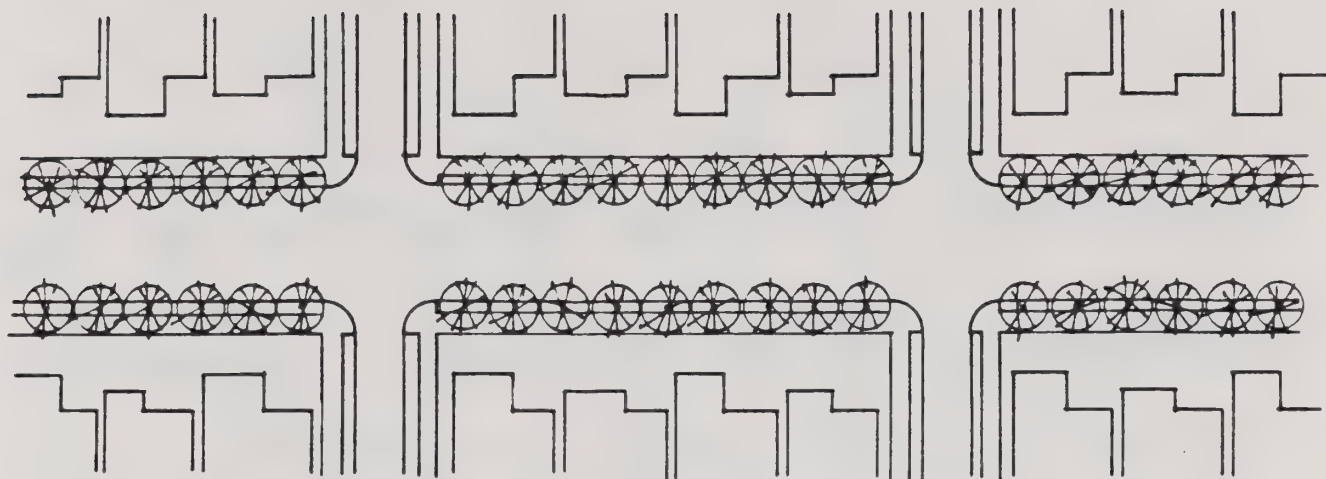
"Monocultures", or single species plantings have been the subject of much debate in the urban forestry profession. While it is generally agreed that large plantings of one tree species increases the possibility of mass insect or disease infestation, there has been no consensus on what constitutes a "large" planting. A street lined with closed-canopy, mature trees of one species is a beautiful place to live or visit. City blocks planted with only one or two species provide a sense of unity and identity to that block, its residents and visitors.

We would not consider a single species planting on one block to be a monoculture. The distribution of these one block segments would be of concern, however, since discontinuous but close distribution of single species plantings might encourage the problems associated with monocultures. Diversity of tree species within city neighborhoods would be more important than diversity between neighborhoods. Generally speaking, no more than 10% of the city's street and park trees should be planted to a single species in the future.

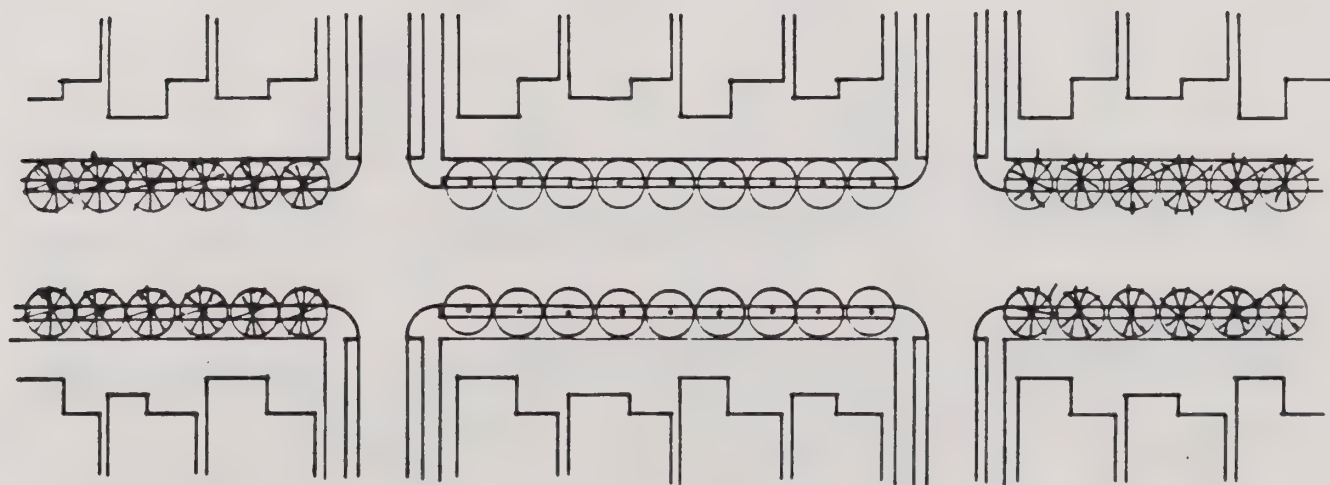
SUGGESTED PLANTING PATTERNS FOR MAJOR STREETS

Major thoroughfares, including 13th St., Pennsylvania Ave., Barrett Ave., Cutting Blvd., Harbour Way, 23rd St., San Pablo Ave., Potrero Ave., Carlson Ave., and Ohio Ave. were inspected and evaluated for future street tree plantings. Species recommendations can be found in the computer data base installed at the Public Works Department.

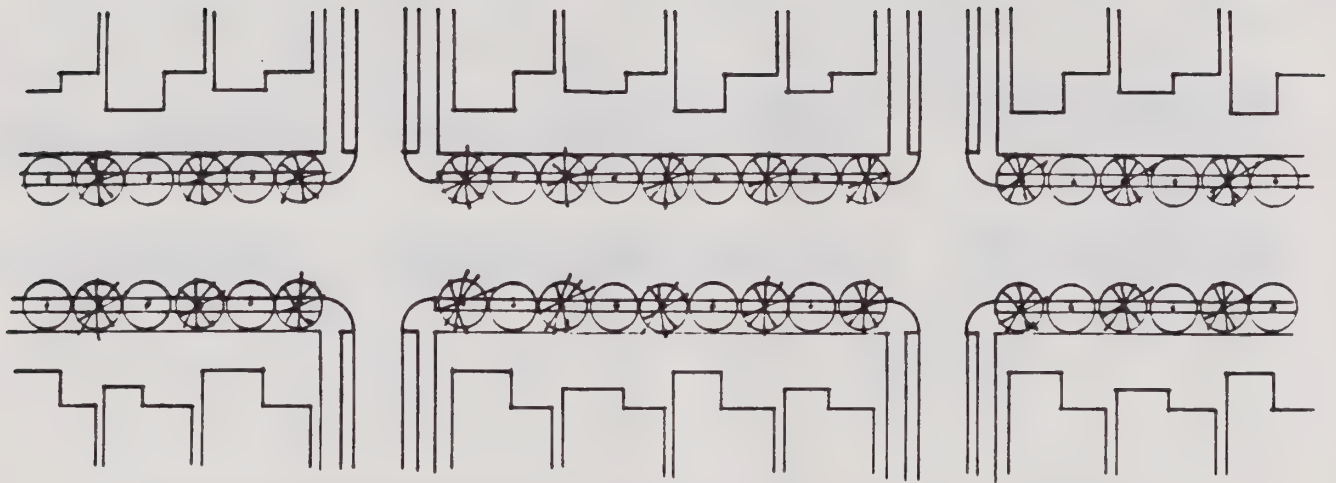
The following pages display a variety of patterns for street tree planting.



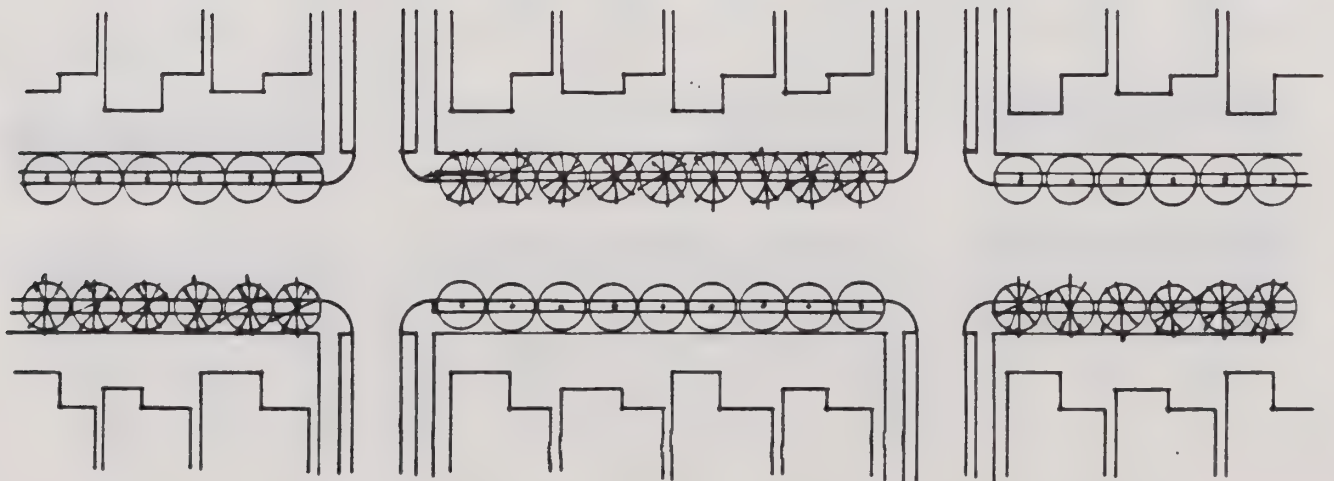
1. Same species used on both sides of the street.



2. Alternating species by block: two species used on street, with one species used on both sides of the street for one block, than different species used on both sides of the street for the next block, and then back to the first species.



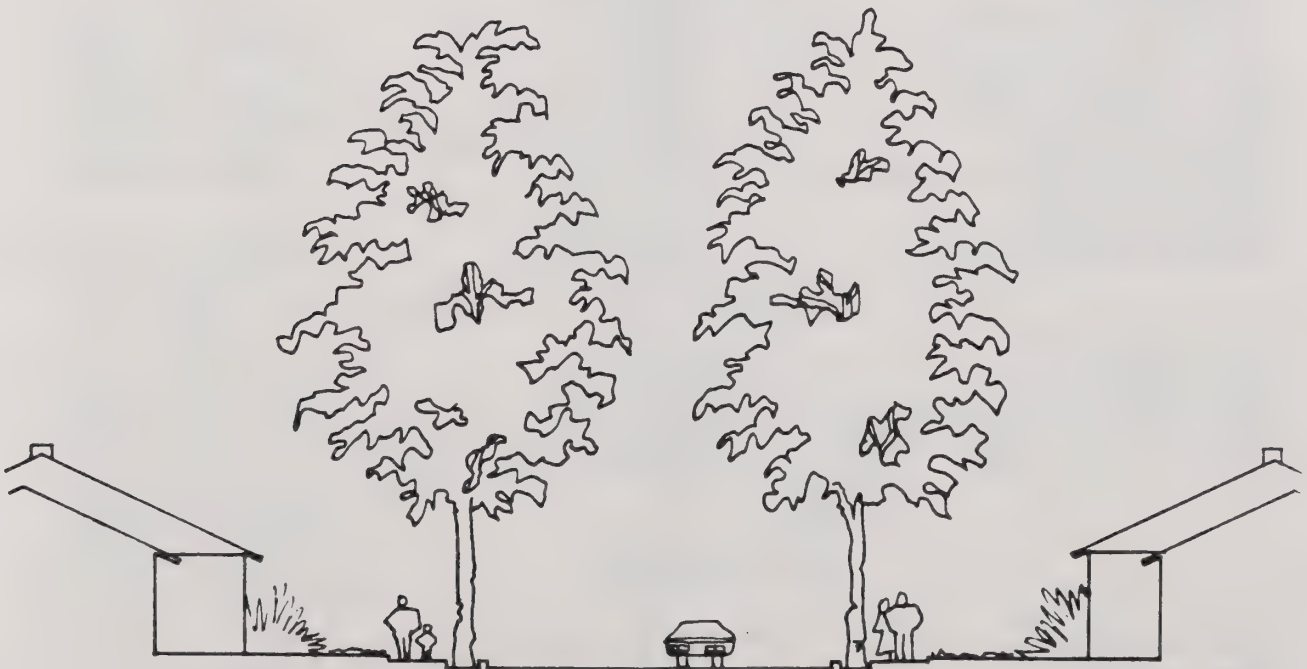
3. Two species planting mix for a single block face: for example, Liquidambar at one address, and Ginkgo at the next address in a repeating pattern



4. Alternate block planting: two species used on a street with species alternating from one side of the street to the other and from block to block in a triangular pattern.



5. On streets where high voltage wires are present on one side of the street, two different species may be used. Because high voltage wires must be kept clear of all foliage, a rounded large-sized tree species which grows no taller than the 40 foot wire height will be selected. The street side without wires will accomodate taller, larger trees.



6. On streets with no high voltage wires on either side, the same tall, large species may be planted on both sides.

SUGGESTED PLANTING PATTERNS FOR MAJOR GEOGRAPHICAL AREAS

The City of Richmond can be divided between six major areas including Point Richmond, Hilltop, Richmond annex, central Richmond, El Sobrante and Marina. Each area was reviewed to determine which species would perform best and enhance the aesthetic appeal of the neighborhood. The results of that review are described below.

El Sobrante

(See Map Area A.)

The climate of this portion is warmer in summer and cooler in winter than many other parts of Richmond, due to its more inland location.

The soils range from an alkaline black clay to a reasonably good tan, neutral clay. Tree selection in this area must be based on drought tolerance, adaptability to the planting space available, and the soil type of the site. If black or gray soil is encountered at the proposed planting area, only species listed as tolerant of alkaline conditions should be used.

Alkaline Soils

Scientific Name

Common Name

Betula nigra

River Birch

Koelreuteria paniculata

Golden Rain Tree

Melaleuca quinquenervia

Cajeput Tree

Metrosideros excelsus

New Zealand Christmas Tree

Pinus canariensis

Canary Island Pine

Platanus acerifolia 'Yarwood'

London Plane

Tristania conferta

Brisbane Box

Melaleuca styphellioides

Prickly Paperbark

Purchase from Oregon:

Acer campestre

Hedge Maple

Acer nigrum 'Green Column'

Black Maple

Acer pseudoplatanus

Sycamore Maple

Tan to Brown Soils

Aesculus carnea

Red Horsechestnut

Alnus cordata

Italian Alder

Betula nigra

River Birch

Celtis australis

European Hackberry

Scientific NameCommon Name

<u>Celtis sinensis</u>	Chinese Hackberry
<u>Eucalyptus ficifolia</u>	Scarlet Gum
<u>Eucalyptus polyanthemos</u>	Silver Dollar Gum
<u>Fraxinus 'Moraine'</u>	Moraine Ash
<u>Fraxinus oxycarpa 'Raywood'</u>	Raywood Ash
<u>Geijera parviflora</u>	Australian Willow
<u>Ginkgo biloba 'Fairmont'</u>	Fairmont Maidenhair Tree
<u>Koelreuteria bipinnata</u>	Chinese Flame Tree
<u>Koelreuteria paniculata</u>	Golden Rain Tree
<u>Magnolia grandiflora 'Russet'</u>	Southern Magnolia
<u>Magnolia grandiflora 'St. Mary'</u>	Southern Magnolia
<u>Melaleuca linariifolia</u>	Flax-Leaved Paperbark
<u>Melaleuca quinquenervia</u>	Cajeput Tree
<u>Metrosideros excelsus</u>	New Zealand Christmas Tree
<u>Pinus canariensis</u>	Canary Island Pine
<u>Pistacia chinensis</u>	Chinese Pistache
<u>Platanus acerifolia 'Yarwood'</u>	London Plane
<u>Prunus caroliniana</u>	Carolina Laurel Cherry
<u>Pyrus calleryana 'Aristocrat'</u>	Aristocrat Flowering Pear
<u>Quercus agrifolia</u>	Coast Live Oak
<u>Quercus suber</u>	Cork Oak
<u>Quercus virginiana</u>	Southern Live Oak
<u>Sapium sebiferum</u>	Chinese Tallow
<u>Sophora japonica</u>	Scholar Tree
<u>Tristania conferta</u>	Brisbane Box
<u>Tristania laurina</u>	Swamp Myrtle

Purchase from Oregon:

<u>Acer campestre</u>	Hedge Maple
<u>Acer nigrum 'Green Column'</u>	Black Maple
<u>Acer pseudoplatanus</u>	Sycamore Maple
<u>Acer rubrum 'Armstrong'</u>	Armstrong Maple
<u>Acer rubrum 'October Glory'</u>	October Glory Maple
<u>Carpinus betulus fastigiata</u>	Fastigiata Hornbeam
<u>Carpinus caroliniana</u>	Carolina Hornbeam
<u>Fraxinus americana</u>	American Ash
<u>Robinia pseudoacacia</u>	
<u>'Umbraculifera'</u>	Globe Locust
<u>Tilia americana 'Redmond'</u>	Basswood
<u>Tilia cordata 'Chancellor'</u>	Little-Leaf Linden

Experimental trees:

Scientific Name

Common Name

Acer campestre
Acer nigrum 'Green Column'
Acer pseudoplatanus
Acer rubrum 'Armstrong'
Angophora costata
Betula nigra 'Heritage'
Carpinus betulus fastigiata
Carpinus caroliniana
Cinnamomum glanduliferum
Eucalyptus microtheca
Eucalyptus parvifolia
Laurus x 'Saratoga'
Melaleuca styphelioides
Nyssa sylvatica
Quercus robur
Robinia pseudoacacia
 'Umbraculifera'
Sophora japonica 'Regent'
Tilia americana 'Redmond'
Tilia cordata 'Chancellor'

Hedge Maple
 Black Maple
 Sycamore Maple
 Armstrong Maple
 Argyle Apple
 Heritage River Birch
 Fastigate Hornbeam
 Carolina Hornbeam
 Himalayan Camphor
 Flooded Box
 Little-Leaved Gum
 Hybrid Laurel
 Prickly Paperbark
 Tupelo
 English Oak

 Globe Locust
 Scholar Tree
 Basswood
 Little-Leaf Linden

Hilltop

(See Map Areas B,C.)

Many parts of this area have very poor soils and planting spaces for trees are of a very limited size. Additionally, strong winds are present in this area much of the time, increasing the chance for wind throw either because of inadequate root establishment, wind sail in the crown, or a combination of the two factors.

For these reasons, species selection is especially critical if the investments in establishing new trees are to be realized in the future. Species which produce very dense foliage such as Prunus caroliniana (Carolina Laurel Cherry) or trees which may produce a large crown without sufficient roots to support it during strong winds, such as Robinia pseudoacacia 'Umbraculifera' (Globe Locust) should not be used in this area.

It should be noted that an overly wet soil condition will exacerbate the wind throw potential since a broad, extensive root system is inhibited by overwet soils.

The following species are recommended for this area:

Scientific NameCommon Name

<u>Alnus cordata</u>	Italian Alder
<u>Betula nigra</u>	River Birch
<u>Celtis australis</u>	European Hackberry
<u>Eucalyptus polyanthemos</u>	Silver Dollar Gum
<u>Fraxinus 'Moraine'</u>	Moraine Ash
<u>Fraxinus oxycarpa 'Raywood'</u>	Raywood Ash
<u>Koelreuteria paniculata</u>	Golden Rain Tree
<u>Melaleuca linariifolia</u>	Flax-Leaved Paperbark
<u>Melaleuca quinquenervia</u>	Cajeput Tree
<u>Metrosideros excelsus</u>	New Zealand Christmas Tree
<u>Pinus canariensis</u>	Canary Island Pine
<u>Pistacia chinensis</u>	Chinese Pistache
<u>Platanus acerifolia 'Yarwood'</u>	London Plane
<u>Pyrus calleryana 'Aristocrat'</u>	Aristocrat Flowering Pear
<u>Quercus agrifolia</u>	Coast Live Oak
<u>Sophora japonica</u>	Scholar Tree
<u>Tristania conferta</u>	Brisbane Box
<u>Tristania laurina</u>	Swamp Myrtle

Purchase from Oregon:

<u>Acer campestre</u>	Hedge Maple
<u>Acer nigrum 'Green Column'</u>	Black Maple
<u>Acer pseudoplatanus</u>	Sycamore Maple
<u>Fraxinus americana</u>	American Ash

Experimental trees:

<u>Eucalyptus microtheca</u>	Flooded Box
<u>Eucalyptus parvifolia</u>	Little-Leaved Gum

Central Richmond

(See Map Area D.)

The species selected for the other five areas of Richmond will be successful in the core area of Richmond if care is taken to match microsite conditions with tree characteristics (See the list of species suitable for Richmond in the "Tree Species Selection" section). The absence or presence of high tension power lines and the space available for root development are the two most significant factors to consider when selecting suitable species.

Richmond Annex

(See Map Area E)

This area is greatly affected by its proximity to the Bay. Because of this, trees planted in this area must be tolerant of constant salt laden winds. Some portions of it, such as the area near East Shore Park, have black, alkaline clay soils. Other areas have neutral brown soils of excellent quality, as on Potrero Avenue. These conditions will support virtually any plant desired.

Where the microsite is wind-protected, the only controlling factors in tree selection here will be the soil type and the available planting space. Since many of the planting spaces here are generous, large-growing, tough trees should be used here.

Scientific Name

Common Name

Acer campestre

Hedge Maple

Betula nigra

River Birch

Celtis australis

European Hackberry

Eucalyptus gunnii

Cider Gum

Eucalyptus polyanthemos

Silver Dollar Gum

Fraxinus 'Moraine'

Moraine Ash

Fraxinus oxycarpa 'Raywood'

Raywood Ash

Ginkgo biloba 'Fairmont'

Fairmont Maidenhair Tree

Koelreuteria paniculata

Golden Rain Tree

Melaleuca quinquenervia

Cajeput Tree

Metrosideros excelsus

New Zealand Christmas Tree

Pinus canariensis

Canary Island Pine

Pyrus calleryana 'Aristocrat'

Aristocrat Flowering Pear

Quercus suber

Cork Oak

Quercus virginiana

Southern Live Oak

Sophora japonica

Scholar Tree

Tristania conferta

Brisbane Box

Purchase from Oregon:

Acer nigrum 'Green Column'

Black Maple

Acer pseudoplatanus

Sycamore Maple

Fraxinus americana

American Ash

Experimental Trees:

Robinia pseudoacacia

'Umbraculifera'

Globe Locust

Angophora costata

Argyle Apple

Eucalyptus microtheca

Flooded Box

Eucalyptus parvifolia

Little-Leaved Gum

Point Richmond

(See Map Area F.)

The residential areas of Point Richmond tend to be rural in nature, lacking sidewalks and curbs. City efforts at reforestation should concentrate on the downtown commercial area.

Soils in the Point Richmond area are in the Millsholm series. Drainage may be a problem in some areas.

The recommended species for the commercial area of Point Richmond include:

<u>Scientific Name</u>	<u>Common Name</u>
<u>Laurus</u> x 'Saratoga'	Hybrid Laurel
<u>Tristania</u> <u>laurina</u>	Swamp Myrtle
<u>Pyrus</u> <u>calleryana</u> 'Aristocrat'	Aristocrat Pear

Marina Area

(See Map Area G.)

The soils in the Marina are composed of bay fill mud, which is a gray, alkaline clay with very poor percolation rates. Where sand has been laid in at a depth of two to three feet over bay mud, the root environment in the sand is improved. The poor conditions below the sand, however, still determine long-term tree success.

This area's proximity to the ocean means that trees must be selected for their tolerance not just of soil conditions, but to constant salt laden winds as well.

<u>Scientific Name</u>	<u>Common Name</u>
<u>Alnus</u> <u>cordata</u>	Italian Alder
<u>Koeleruteria</u> <u>paniculata</u>	Golden Rain Tree
<u>Melaleuca</u> <u>quinquenervia</u>	Cajeput Tree
<u>Metrosideros</u> <u>excelsus</u>	New Zealand Christmas Tree
<u>Pinus</u> <u>canariensis</u>	Canary Island Pine
<u>Pyrus</u> <u>calleryana</u> 'Aristocrat'	Aristocrat Flowering Pear

Purchase from Oregon:

<u>Acer</u> <u>campestre</u>	Hedge Maple
<u>Acer</u> <u>nigrum</u> 'Green Column'	Black Maple

Experimental trees:

<u>Melaleuca</u> <u>styphellioides</u>	Prickly Paperbark
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Map of Major Geographical Areas

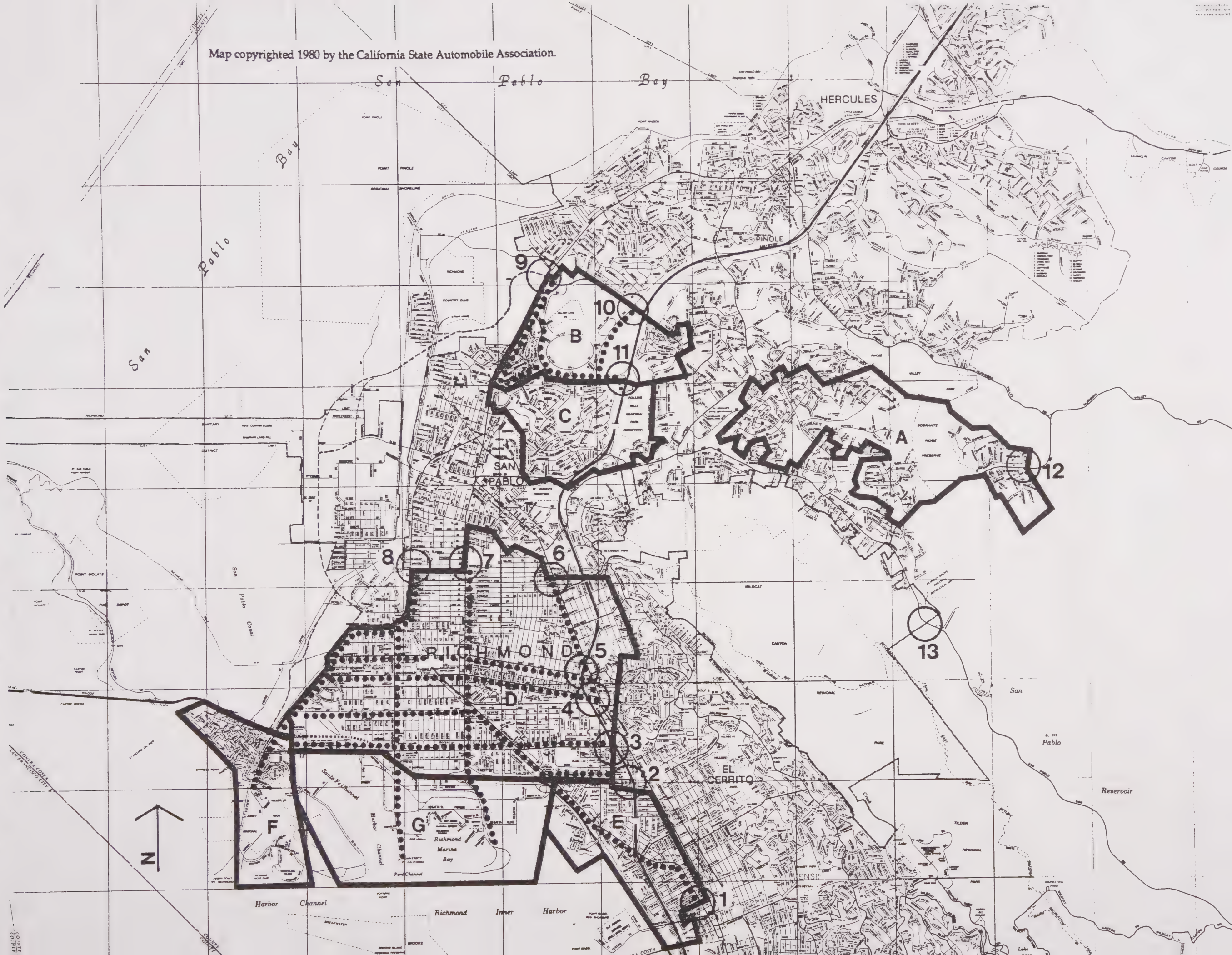
Map copyrighted 1980 by the California State Automobile Association.

Legend

- City Limit
- Proposed By-pass
- Major Thoroughfare
- 5 Key Gateway/Entry
- G Planting Zone

City of Richmond Urban Forestry Management/Master Plan

Planting Zones, Major Thoroughfares, and Entries



GATEWAYS

Gateways are entry points to the city. Properly designed and planted, they make a statement about the identity and character of the city. The City of Richmond has thirteen major gateways that were evaluated for this project. They include:

1. Palm Trial Area, Northbound I-80 Exit at Macdonald
2. Carlson, between El Dorado St. and San Jose.
3. Potrero, between S. 52nd and 53rd.
4. Cutting Blvd. at I-80.
5. San Pablo at BART/MacDonald.
6. Barrett Ave. at westbound I-80 exit ramp.
7. San Pablo at Lowell.
8. 23rd Street at Costa.
9. 13th Street at Costa.
10. San Pablo Avenue at Atlas Road.
11. I-80 at Atlas Road.
12. I-80 at Hilltop Drive.
13. Castro Ranch Road at Richmond City Limit.
14. San Pablo Dam Road at Richmond City Limit.

Guidelines for Development of Key Gateways

Planting gateways should take priority over planting individual streets or other sections of the city. Very few trees are present at some gateways. Tree planting at these locations will create maximum contrast with the unplanted corridors along adjacent streets.

Gateways, generally, should be bold and make a memorable visual identity for the site. To obtain the desired visual effect, trees for one or two block plantings must be either closely spaced, unusual, emphatic, or very large in scale. At least one of these characteristics should be selected as appropriate for each site. We recommend using as many of the aforementioned characteristics as possible. Quercus rober 'Skymaster' and Pinus canariensis, for example, are canopy trees of majestic scale suitable for such gateway planting.

The context of the site should be considered, however, as well as whether the gateway should be the most important visual amenity. For example, where the natural landscape defines the character of the site, the gateway should be understated.

A checklist of constraints and opportunities for each gateway should be developed. The list should include the presence of overhead wires, street lights, underground utilities, widths of planting strips and medians, adjacent uses (residential, commercial, etc.), existing plants to remain, signs, the number of curb cuts, the width of the street, the influence of

topography, distant views, and the space available within the right-of-way.

Key Gateways

1. Palm Demonstration Area, Northbound I-80 Macdonald Exit.

Site Description - Entry into Richmond from northbound I-80. This well traveled off-ramp loops under the freeway and eventually goes past a popular shopping mall. Currently, there are many damaged trees and vacant sites. This Trial Area is to extend to the median in front of the mall, as well as the wide medians on Macdonald between 41st and I-80.

Recommendation - This area has been designated as the palm demonstration area, with palms used as a bold design statement. Here, species, as well as transplant and maintenance methods will be tried in order to insure the survival of future plantings of these highly regarded and expensive plants. Any plans for this area must be reconciled with CalTran's future plans to widen I-80.

2. Carlson, between El Dorado St. and San Jose.

Site Description - Entry into Richmond traveling north. Median approximately 4' wide with several unattractive trees. City limit sign mid-block. Residential area. No planting strips. One small street tree on the east side in front of the city limit sign. Median ends at Van Fleet, one block north of San Jose.

Recommendation - Replant median and install trees at the curb on both sides of the street to Van Fleet.

3. Potrero, between S. 52nd and 53rd

Site Description - Entry into Richmond traveling west. Residential area and Stege Elementary School on the south side (A school crossing exists mid-block west of 52nd). Overhead wires on south side. Planting strips both sides except in front of the school. Planting is plentiful behind the sidewalks. Several Sycamores exist on the north side across from the school.

Recommendation - Plant trees in side strips between 52nd and 49th and in tree wells in front of the school.

4. Cutting Blvd. at I-80.

Site Description - Entry into Richmond traveling west. Underpass, then generous side strips, approximately 8' wide, north and south. Eleven new trees have been planted on the south side; seven new trees on the north side. Existing median has no significant planting. Cobra head lights exist on both sides.

Recommendation - Plant CalTrans right-of-way with emphatic trees. Since trees have recently been planted, they should remain and be supplemented with a row in the median and a flowering ground cover.

5. San Pablo at BART/MacDonald - Top Priority.

Site Description - Entry into Richmond traveling north. Very wide and busy commercial street with one foot wide median in this section. Tree planting could occur behind the sidewalk in some areas, but is probably best planned in tree wells at the curb. Cobra head lights exist on both sides. Chain link fencing occurs behind the sidewalk on the west side.

Recommendation - Plant trees which will ultimately grow to majestically scaled specimens on both sides of the street in tree wells.

6. Barrett Ave. at Westbound I-80 exit ramp.

Site Description - Entry into Richmond traveling west. Split off ramp from I-80. There is no right-of-way along Barrett for planting. The only available space for treatment is the CalTrans right-of-way.

Recommendation - Plant at end of off ramp, where vehicles slow or stop.

7. San Pablo at Lowell - Top Priority.

Site Description - Entry into Richmond traveling south. Very wide commercial street, no median. Numerous curb cuts are a serious constraint to tree planting. Overhead wires exist on both sides. Four tree wells exist from Natalie to Andrade on the west side. Several tree wells, located approximately two feet behind the curb, with shrubs as well as low trees are on the east side. Entry is made more dramatic as City Limit occurs at the top of a hill (at Natalie) so the view up and down the street should be

accented to match the entry. Plantings must be dramatic to compete with the multitude of signs, wires, and traffic congestion on the wide street.

Recommendation - Plant as many emphatic species as is possible given the number of curb cuts. Plant to McBryde.

8. 23rd Street at Costa.

Site Description - Entry into Richmond traveling south. Commercial street without overhead wires. Cobra head lights exist on both sides. A few street trees exist.

Recommendation - Plant additional street trees on both sides to fill out existing planting for a block and a half after City Limit sign.

9. 13th Street at Costa.

Site Description - Entry into Richmond traveling south. Existing hedge on west, overhead wires on the east. View from City Limit sign is made more interesting since the road ahead curves to the west and ascends.

Recommendation - Plant trees on both sides of the street wherever sidewalk widths are generous enough to accommodate tree wells. Investigate the possibility of constructing a median for at least one block and plant same tree species to create a bower effect.

10. San Pablo Avenue at Atlas Road.

Site Description - Entry into Richmond traveling south. Intersection is approached traveling uphill. Lights and trees are in the median prior to intersection. The east side, at new residential development, is planted. At the intersection, there are "empty" medians. There is ample room and opportunity on both sides for effective planting. Ahead and upslope, and therefore very visible, a triangular median (unplanted) faces the traveler and would be an excellent location for an entry treatment.

Recommendation - Plant trees on the sides of the street and a small grove in the median "bulge" upslope. This median area would also be effective with a flowering groundcover.

11. I-80 at Atlas Road.

Site Description - Entry into Richmond traveling west. This intersection has not been built yet. It will be critical to take the topography into account when specific planting is recommended here. This intersection/entry should not be made more important visually from I-80 than the entry at Hilltop Drive.

12. I-80 at Hilltop Drive.

Site Description - Entry into Richmond traveling west. Approach from I-80 is uphill. The traveler sees the Hilltop monument sign and is aware of a view west to Mt. Tamalpais. The off ramp is planted with Eucalyptus on the south and wildflowers on the north on the steep embankment. Ahead along Hilltop, there are dark green conifers. An opportunity exists to plant the triangular median at the off ramp intersection with Hilltop Drive, in addition to planting the currently weed filled sides.

Recommendation - Plant trees of a height which will not obstruct traffic sight lines in the triangular median. Plant deciduous trees as foreground planting to the pines, and continue this theme on both sides of Hilltop Drive for an effective distance.

13. Castro Ranch Road at Richmond City Limit.

Site Description - Entry into Richmond traveling west. Unlike the previous sites, this area is pastoral in character traveling toward Richmond. The approach is uphill and curving. After rounding the bend, residential developments are present (one is complete, another is under construction) yet the street is still informal in character. There are no curbs, for example. Planting in informal groupings of trees, ground covers, and shrubs has been completed on the north side.

Recommendation - Gateway planting here should be simple and not urban in character. Two Phoenix canariensis flanking the road would be an appropriate symbolic entry, as these were often planted at farmhouse doors in California's rural areas.

14. San Pablo Dam Road at Richmond City Limit.

Site Description - Entry into Richmond traveling northwest. This site is unique in its rustic character. Unlike the pastoral quality of gateway area #12, this approach into Richmond occurs after driving through the Wildcat Canyon Regional Park. The park is forested and the views toward the reservoir are dramatic. Entry into Richmond at the city limit sign is uneventful. The approach is downslope and an entry planting might best be located further downhill perhaps at Tri Lane, where commercial development (and signs) begin.

Recommendation - Like gateway area #11, entry planting should be understated and fitting within its context. An appropriate site should be determined for native plants which occur in the Park. These could be planted in a somewhat more formal arrangement in order to transition from the native landscape to an urban character. For example, plantings with Quercus spp. street tree could be implemented.

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